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Presses, &c.—H. E. Newton (com.), 1769. T. A. Weston, 1985. C. de la Muela (com.), 1975.

Printing and Transferring; Type and other Surfaces for Printing, Composing, and Distributing Type.—W. Bland, 1561. F. W. Smith, 1611. W. Rumney, 1629. F. Wicks, 1640. W. Brierley (com.), 1731. R. Lanham, 1736. E. G. Brewer (com.), 1881. B. C. Leckoussi and J. Swain, 1999. J. M. Josias, 2011.

Propelling Carriages.—H. P. Holt and F. W. Crossley, 1912.

Propelling Machinery, Transmitting Power and Motion, Converting Movements.—E. J. Beseme, 1880. T. A. Weston, 1985.

Propelling Ships, Propellors, Paddle-wheels and Screws.—J. H. Johnson (com.), 1624. N. D. Spartali, 1670. W. J. Buller, 1685. A. Morton, 1943.

Pumps, Pumping and Raising Water and other Liquids Pumps, Pistons, and Packing.—L. A. Groth, 1633. C. Pieper (com.), 1722. H. Beardshaw, 1723. H. J. Haddan (com.), 1806. J. Newton and J. Cowper, 1974.

Punching and Perforating.—A. M. Clark (com.), 1684. J. M. Josias, 2011.

Rags, &c.—C. W. Smith, 1941. J. Rhodes, 1973.

Railways, Permanent Way, Rail Joints, Chairs and Sleepers, Portable Railways, Atmospheric Railways, Switches, points, Crossings, and Turntables.—H. Bridgewater, 1603. J. B. Fell, 1638. J. Horton, 1681. M. Gossi, 1774. A. M. Clark (com.), 1796. W. H. Tooth, 1843. J. Gardner, 1922. W. R. Lake (com.), 1968.

Railways, Carriages, Coupling, Uncoupling, and Altering Position of Carriages and Engines.—W. R. Lake (com.), 1601. A. T. Booth, 1651. K. Knott, 1801. G. W. H. Brogden, 1920. R. Baxendale and J. Heald, 1923.

Reaping, Mowing, Making Hay, Gathering in Produce.—E. H. Tooley, 1589. S. B. Bamford, 1590. J. B. Curtis, 1820. J. Howard, E. T. Bousfield, and G. Gibbs, 1857. C. T. Burgess, 1883. W. H. Sleep, 1921. S. Kell and A. Meats, 1927.

Refrigerating, &c.—W. R. Lake (com.), 1601. K. Knott, 1801. H. J. Haddan (com.), 1806. K. Knott, 1876. L. Rohrmann, 1894. W. R. Lake (com.), 1915.

Registering, &c.—R. Willis, 1606. H. J. Haddan (com.), 1610. F. Hoyer, 1065. F. Wirth (com.), 1707. J. N. Maskelyne, 1730.

Sewing and Embroidering.—W. L. Bigelow (com.), 1893. J. R. V. de Castro, 1997.

Shears, &c.—R. C. Fletcher, 1850. J. Taylor and H. Turton, 2010.

Ship and Boatbuilding.—W. R. Lake (com.), 1601. C. F. Henwood, 1644. J. Bramall, 1718. E. H. Hopkins, 1766. K. Knott, 1801. C. O. Weeks, 1882. W. R. Lake (com.), 1915. H. Studdy, 1963. H. E. Newton (com.), 2028.

Ships (Raising Sunken or Wrecked)—T. A. Dillon, 1787.

Sifting, &c.—C. B. Barlow (com.), 1579. G. Stanier and J. Hewer, 1612. J. T. Dawes, 1758. W. R. Lake (com.), 1842.

Signals, Alarms, Conmunicating Apparatus, Conveying Sounds.—J. W. Fowle, 1580. J. W. Fowle, 1581. A. Clarke, 1596. H. J. Haddan (com.), 1601. J. Fitzgerald, 1650. R. P. Gill, 1992.

Soap.—W. F. Jack, 1634.

Spinning and Preparing for Spinning.—H. J. Haddan (com.), 1567. W. R. Lake (com.), 1600. J. H. Dickson, 1642. A. Taylor and D. Jones, 1685. S. Wrigley, 1674. I. Holden, 1709. W. A. Barlow (com.), 1765. J. C. Mewburn (com.), 1771. J. Russell, 1823. J. M. Bottomley, 1851. G. Lumb, 1935. M. Wright, 1939. W. R. Lake (com.), 1956. W. R. Lake (com.), 1957.

Springs.—J. Furstenhagen (com.), 1877. R. W. Soldenhoff (com.), 1989. W. Lockwood and H. H. Andrew, 2009.

Stamps, &c.—A. Norris, 1641.

Steam Boilers, &c.—R. Illingworth, 1563. J. Taylor, 1636. G. Hill, 1649. C. Pollard, 1827. K. Peacock and C. Holt, 1910.

Steam Engines.—J. B. Fell, 1638. G. Hill, 1649. T. Aveling, 1746. C. Pollard, 1827. W. R. Lake (com.), 1840. W. H. Daniels, 1886. L. Schwartzkopff, 1948. G. Maxted, 1961. A. M. Clark (com.), 1996.

Steering or Guiding Ships and Boats.—C. R. Simey, 1586. G. D. Davis, 1662. G. Donkin and B. G. Nichol, 1899.

Sugars, &c.—F. C. Glaser (com.), 1783. A. and J. D. Scott and T. R. Ogilvie, 1869. C. de la Muela (com.), 1975.

Teaching.—R. Walkington, 1911.

Telegraphs; Telegraph Printing Apparatus.—W. R. Lake (com.), 1652. G. J. Droste, 1813. H. J. Haddan (com.), 1830.

Tilling and Cultivating, &c.—G. W. Chambers, 1694. T. McKenzie, 1739. J. Lancaster, 1786. T. C. Darby, 1775.

Tobacco and Snuff, Cigars, Cigar-holders, Pipe and Cigar-lighters, Smoking-pipes, Tobacco-pouches.—R. Quin, 1620. R. Wood, 1929.

Tramways and Tramway Carriages, Tramway Locomotives.—J. D. Larsen, 1637. M. Gossi, 1774. J. Gowans, 1822. G. C. Sonnenthal, 1835. W. H. Tooth, 1834. A. C. Pain and J. Cleminson, 1942.

Upholstery.—G. Dittmar (com.), 1762.

Valves, Taps, Stop Cocks, Plugs; Regulating the Flow and Pressure of Fluids.—T. Haresnape, 1625. G. D. Davis, 1662. T. Leemrng and R. Ray, 1678. J. H. Johnson (com.), 1713. H. J. Haddan (com.), 1806. P. Everitt, 1854. F. Fardon, 1863. A. M. Clark (com.), 1872. J. Schwartzkopff (com.), 1948. G. V. Maxted, 1951.

Velocipedes, Bicycles.—J. Bramall, 1710. H. Bate, 1741. J. Rivington, 1802. T. Butler, 1909. J. Clark, 1944. J. G. Wilson (com.), 1967. F. W. Jones, 1976.

Ventilation; Supplying and Purifying Air for Buildings, Mines, Ships, Carriages, &c.—H. J. Hancock, 1607. A. B. Wood (com.), 1615. L. W. Leeds, 1632. J. C. Mewburn (com.), 1625.

Waterclosets, &c.—A. B. Wood (com.), 1615. H. and F. Priestley, 1680. H. and W. Sutcliffe, 1934.

Waterwheels and Engines, &c.—J. Archer, 1799. J. C. Stevenson and E. Mounsey, 1953.

Weaving, Braiding, Plaiting, Preparing for Weaving.—E. Jackson, 1597. R. Meadows and R. T. Cotton, 1702. J. and H. Ainsworth, 1514. M. Unstadter, 1721. H. Bracewell, J. Bulcock, and J. Rushton, 1724. T. Hanson, 1937. C. Littlewood, 1945.

Wheels for Carriages, &c.—J. Elder, 1578 J. Cleminson, 1980.

Wheels for Machinery.—W. P. Thompson (com.), 1720.

Window Blinds, &c.—H. J. Hancock, 1607. A. Shepherd, 1977.

Wood and Veneers, &c.—C. Pollard, 1827. G. B. Boulton, 1954.

⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

RECENT AMERICAN AND FOREIGN PATENTS.

A scoop, whose body consists of an unbent wooden veneer or circular section of a wooden block, has been patented by Mr. W. C. Freeman, of Louisiana, Mo. The head is rabbeted and secured to the bowl by glue and pins or nails.

An improved furnace for roasting ores has been patented by Mr. C. E. Robinson, of Brooklyn, N.Y. The process of roasting, as conducted in this furnace, consists in subjecting the pulverised ore simultaneously to the action of a jet of flame, and a jet of air, steam, or gas introduced underneath the charge. By this means the particles of ore are kept in continual suspension during the operation of roasting.

An improvement in road planers, patented by Mr. J. P. Lafetra, of Shrewsbury, N. J., consists of a blade suspended diagonally from the under side of a frame supporter by wheels, and provided with an elevating and depressing screw, by which the blade is thrown into position for use, or raised so that it may be moved about.

Mr. W. L. Allen, of Belle Plaine, Kan., has patented an improved baker's cabinet, which is provided with flour chests placed so as to deliver flour to sieves placed over the mixing bowls; it is also provided with compartments and drawers for containing spices, lard, &c.

Mr. G. T Snyder, of Natrona, Pa., has devised a novel boiler, in which the main cylindrical portion is supported in a hollow casing, which forms the fire-box. The two parts of the boiler are connected by inclined tubes.

A rotary valve for steam engines, consisting of two cylindrical valves placed upon a common stem or shaft which is revolved by connection with the engine, is the invention of Mr. C. A. Knowlton, of Kankakee, Ill. The valves have a plurality of ports, and are made tapering to admit of adjustment to compensate for wear. A simple and novel reversing gearing is attached.

An improved tool for cutting flues out of boilers has been patented by Mr. J. H. M'Graw, of Oswego, N.Y. The tool head carries revolving cutters, and may be inserted in the tube and expanded by a wedge pin while it is turned by a wrench to cut the flue.

An improved cultivator fender, which may be used with either a one-horse or two-horse cuttivator, has been patented by Mr. Andrew Simmons, of Green Vale, and Michael Simmons, of Lena, Ill. It is designed to prevent the earth from being thrown upon the plants by the cultivator ploughs.

The President of the Institution of Civil Engineers (H. F. Bateman, Esq., F.R.S.S. L. and E.) gave a *conversazione* at the South Kensington Museum on Monday, 26th May, the proceedings being of high interest, as the rooms, which contained many objects of engineering and scientific importance, were lighted by the electric light as provided by Dr. Siemens, Messrs. Higgins, Werdermann, Wilde, Serrin, and Jablochkoff. Mr. E. Cowper's writing telegraph seemed to be a special attraction. Unfortunately we cannot now find space for more detailed particulars.

Reviews.

CLEMENTS' ORGANIC CHEMISTRY.

"A Manual of Organic Chemistry, Practical and Theoretical, for Colleges and Schools, Medical and Civil Service Examinations, and especially for Elementary, Advanced, and Honours Students at the Classes of the South Kensington Department." By HUGH CLEMENTS, of H.M. Civil Service, &c. London: Blackie and Co., 49 and 50, Old Bailey, E.C.; Glasgow, Edinburgh, and Dublin.

THIS work appeared in a serial form in the *English Mechanic and World of Science* down to the end of the "Identifications of Organic Bodies."

The remaider of the work, for various reasons, did not appear in that journal. and the author states that he hopes this latter portion will meet with as much approbation as did theformer.

The original idea was to adapt the work to suit the requirements of the Elementary and Advanced Syllabus of the Science and Art Department; but the author trusts that by the extra matter appended, and the answers given to the May examinations during the last ten years on the elementary, advanced, and honours stages, that the work will enable students to pass in honours, and also form a text-book for students at public schools and colleges, and candidates preparing for medical, Civil Service, or other examinations.

We refrain from quoting any particular passage, for the book, being highly technical, offers little temptation to this. As a book of instruction it has our hearty commendation.

SANITAS.

"Reports and Testimonials as to 'Sanitas' (Disinfectant, Deodoriser, and Antiseptic), by Medical, Sanitary, and other Authorities." "London: The "Sanitas" Company, Limited, Offices and Works, Letchford's Buildings, Three Colt Lane, Bethnal Green, E.

WE are gratified to find that this valuable product, which formed the subject of a descriptive notice in our columns some time ago, proves to be even more worthy of high esteem than we affirmed it to be, and we have great pleasure in noticing the pamphlet before us, which gives a number of favourable reports as to the use of "Sanitas" by vestries, local boards, medical officers of health, surveyors, and sanitary inspectors; also reports on the use of "Sanitas" in hospitals, workhouses, and medical practice; likewise reports on its use as a preservative and disinfectant chiefly by unprofessional persons, and as a preventive against cattle diseases and as a deodoriser for kennels, dog and cattle shows, &c., with a collection of press notices.

As an interesting and instructive statement of tested advantages, we quote the following remarks made at a meeting of the Northampton Rural Sanitary Authority, held 4th December, 1878, on the subject of "Sanitas," by Alfred Haviland, Esq., medical officer of health to the Northamptonshire combination of sanitary authorities:—The use of some disinfectants is limited in consequence either of their dangerous character, their expense, or their obnoxiousness even to healthy persons. Carbolic acid and chloride of lime well represent this class, and it so happens that these disinfectants are the two mostly relied on for common use. Many fatal cases of poisoning by carbolic acid have been recorded, and lately in one of my districts (Thrapston), a death occurred from this cause. In fact, inspectors dare not leave this poisonous disinfectant in the houses when it is needed, on account of its poisonous character; and are therefore obliged personally to superintend every disinfecting process that takes place during and after the existence of contagious and infectious diseases, the consequence of which is that thorough and homely disinfection during the progress of disease is rendered impracticable. Moreover, the vapour from carbolic acid and the gas from chloride of lime are apt to produce disagreeable effects, as I have just said, even in healthy subjects, by irritating the delicate linings of the lungs and bowels. Again, carbolic acid and chloride of lime are inapplicable where linen and other clothing material requires disinfection. The same may be said of the permanganate of potash, so justly popular as an oxidiser of organic matter; the chloride of lime destroys the fabric and the permanganate stains it. Under these circumstances I was glad when I had submitted to me, in July last, a new disinfectant, which was said to answer all our requirements as an antiseptic and a disinfectant, and to be neither poisonous, inflammable, destructive of clothing, nor offensive either to the healthy or the sick; but which was on the contrary endowed with the power of giving forth in the atmosphere the fragrant odour of a pine forest and oxygen in its most powerful form. This disinfectant, which is called "Sanitas," was said to contain peroxide of hydrogen in solution and certain camphoraceous compounds, all of which are the result of the action of air upon turpentine in the presence of water. Mr. Charles T. Kingzett, F.C.S., who has just written the best book we have on animal chemistry, was the inventor of this remarkable compound. With the view of ascertaining for myself what was the real value of this new disinfectant, I in the first place carefully examined the process by which it was produced. I then satisfied myself by a series of chemical experiments that it really did contain the camphoraceous ingredients and the peroxide of hydrogen (an oxidiser of great power) said to be dissolved in it, and finally I testified its efficacy in arresting putrefaction and in restoring organic matter (when this process had commenced), to sweetness. Its power of preserving meat, fish, game and poultry in the hot summer months is remarkable, and can be verified by any one, and the chemical reagents which give evidence of the existence of the peroxide of hydrogen are of easy application even by those who are not professed chemists. In the sick room it is a most delightful deodoriser, and is especially grateful in pulmonary affections. In surgical cases it removes the fœtid odours from wounds and the discharges from certain organs in a manner that is a boon not only to the sufferer but to the surgeon who attends such cases. In ill-conditioned ulcers it destroys fœtor, and promotes healthy action of the diseased surfaces; in fact, both in hospital and private practice it is coming into general use on account of its remarkable properties. It can be used for cleansing the teeth, and in one's bath; with the spray producer it purifies the atmosphere of the sick room, and is capable of at once removing the most offensive odours. Milk, meat, and fish can be kept for months by its use, and thus to the butcher and fishmonger, as well as to the private individual, it may be made the means of preventing the waste of a large amount of expensive provisions. This disinfectant can be left by the inspectors at the houses of all classes, where disinfection is necessary, and safely used as a substitute for the poisonous carbolic acid and chloride of lime, whether in the form of a liquid or a powder. For this reason, combined with my knowledge of its constituents and efficacy, I recommend that "Sanitas" should be used by your inspectors for certain processes of disinfection which are not performed under their own supervision.

The value of the emanation of certain plants in preventing disease has long been known. We have all heard of the wholesomeness of the pine forest, and lately the *Eucalyptus globulus* has attracted much attention. Many chemists who have laboured much in this path of chemistry, have considered that certain plants have the power of purifying the air by giving off ozone, but it was subsequently proved by Mr. Kingzett that plants do not evolve ozone, but, on the contrary, peroxide of hydrogen. Messrs. Kingzett and Zingler have, by imitating nature in the laboratory, been enabled to produce the peroxide of hydrogen from a compound of vegetable origin in such a form and in such quantities as to render the application of this important antiseptic and disinfecting agent practical to the fullest extent in the hands of your inspectors, thus carrying out what many years ago I pointed out should be done in an article on "Flowers and Fevers," in the *British Medical Association Journal*, 29th March, 1873, viz., to follow up the footsteps of nature in our chemical laboratories and learn how to increase the store of our natural air and water purifiers by e special investigation of the properties of our indigenous flora in their relation to disease.

In conclusion I would observe that in the practical application of "Sanitas" in the sick chamber, especially when any of those diseases called "contagious and infectious" exist, this disinfectant may be used without stint and without fear, for it is not more expensive than carbolic acid or chloride of lime, is more effective, and is not poisonous. In small-pox, scarlet fever (especially during the "peeling" or desquamation process), and other eruptive diseases, the medical man can with safety recommend the skin of his patients to be bathed with it. In diphtheria the mouth, throat, and all the parts within reach may with safety and advantage be washed with it, either by means of a syringe or a sponge dipped in the solution. In typhoid fever, not only may the temperature of the body be reduced by bathing the skin with it, but the poison-bearing discharges from the bowels may be prevented from undergoing the putrefactive process by being treated with it. In typhus the overcrowded room may be oxygenated by the frequent use of it through an efficient spray producer, whilst in cases where there are syphilitic or ill-conditioned ulcers, the diseased parts may be dressed with this disinfectant and the ill effects of their corroding discharges thus arrested, and healthy action of the surfaces promoted. For ordinary purposes, No. 2 solution is the best for general use. The powder, which gives off much peroxide of hydrogen, may be used in the same way as other disinfecting powders, and, lastly, the soap is admirably adapted for washing both the body, the clothes, woodwork, &c. Where animals are kept whose food consists of flesh and offal, such as dogs and pigs, "Sanitas" has a remarkable effect as a deodoriser, as all can testify who visited the late dog show at the Alexandra Palace. On these grounds I have no hesitation in recommending "Sanitas" to your Authority, and in doing so, I feel convinced that I am endeavouring to relieve your inspectors from the heavy responsibility to which the use of poisonous agents is attached.

SMEE'S HOUSE SURGEON.

"The House Surgeon; or, the Doctor at Home." Containing Instructions for the Prompt Treatment of Accident and Emergencies befor the Arrival of Medical Aid. By the late ALFRED SMEE, F.R.S., Surgeon to the Bank of England. Illustrated by Engravings prepared under the direction of the Author. London: Published by the Accident Insurance Company, Limited, 7, Bank Buildings, Lothbury.

THIS is a very valuable little pamphlet, which gives directions of the utmost conciseness as to accidents and other cases requiring medical treatment, where prompt action should be taken before the doctor's attendance can be procured.

The following quotations give a fair sample of the usefulness of this work:—

THE EYE

May be burst by a blow, when the touch of the finger may irremediably destroy it. Put the sufferer in a bed in a dark room. Smear moistened extract of belladonna around the eye. A blow on the eye-ball from a soda-water cork or from a stone concusses the eye. Vision is much impaired. Smear belladonna round the eye, and keep in the darkened room. Consult a surgeon.

LIME AND ROMAN CEMENT IN THE EYE.

Wash the eye with a lotion made of a table-spoonful of white vinegar in a tumbler of water. Lose no time, for delay is serious.

DIRT IN THE EYE.

If the substance be under the lower lid, draw down the lower lid and remove by a piece of moistened paper; if under the upper lid, place a bodkin across the lid, and draw back the lid, so that it is inverted, when it can be removed. Minute pieces of iron are often impacted in the glassy part of the eye, and require to be cut out by the surgeon, but they should not be touched by the patient. They generally come out of themselves in about four days. Bathe the eye with warm water frequently. This statement has two illustrations, one the under and the other the upper lid under treatment. There are many illustrations of similar character in this valuable little work.

SIMULTANEOUS INVENTIONS.

OCCASIONALLY persons residing in places remotefrom each other make the same inventions about the same time. The *New England Journal of Education* mentions a new case of the simultaneous appearance of the same invention as follows:—

"The application of the methods of ordinary writing to telegraphic communications has been a matter of long study and experiment, but hitherto without success. We were shown on Saturday, March 22nd, at our office, a simple contrivance, invented by Prof. Dolbear, of Tufts College, Somerville, Mass., by means of which the handwriting of the operator may be transmitted with the record of the message to the office to which it is sent. Singularly enough, on February 26th, 1879, Mr. E. A. Cowper, of London, exhibited in operation, before the Society of Telegraph Engineers, in that city a writing telegraph, constructed on the same principle as that of Prof. Dolbear; and from the drawings in the *Scientific American* of March 29th one would suppose the instruments identical. The achievement is a valuable one, and both parties are worthy of highest credit as inventors."

THE HISTORY OF DIPHTHERIA.

IT is often said that diphtheria is of modern origin, a penalty for the unsanitary conditions of modern civilisation. Dr. Mackenzie, senior physician to the Hospital for Throat and Chest Diseases in London, finds the disease to be a very ancient one. The first description of it occurs in the writings of an Indian physician, a contemporary of Pythagoras. He next identifies with "askara," a fatal epidemic frequently mentioned in the Talmud. In the seventeenth century diphtheria was widely prevalent in Europe, and extensively fatal. In 1802 Dr. Cullen, of Edinburgh, seems to have described the disease under the name of *cynanche trachealis*, and in 1826 Bretonneau's classical work appeared.

"After this," writes Dr. Mackenzie, "the disease seems to have passed from the minds of English physicians and its very existence almost forgotton." From such forgetfulness the medical profession was thoroughly aroused by the great epidemic of the years 1858-9, since which time diphtheria has not appeared in England with anything like the same malignity.

ANNIVERSARY MEETING OF THE INVENTORS' INSTITUTE.

ON Thursday, 22nd May, 1879, the Annual General Meeting of the Members of the Inventors' Institute was held at 4, St. Mar[illegible]n's Place, Trafalgar Square, Dr. M'Grigor Croft, senior member of the Executive Council, occupying the chair, Sir Antonio Brady, the President, being by indisposition unfortunately compelled to be absent. Amongst those present were—F. H. Varley, Esq., C.E., the Chairman of the Executive Council of the Institute; F. Braby, Esq., J. Greenfield, Esq., T. Blanchett, Esq., M. Zingler, Esq., T. Morgan, Esq., J. Batey, Esq., and other well-known members of the Institute.

The minutes of the last annual general meeting having been read by the Secretary, were passed as correctly entered.

The Chairman then requested the Secretary, Mr. F. W. CAMPIN, to read the Report of the Executive Council, which was as follows:—

SEVENTEENTH ANNUAL REPORT OF THE EXECUTIVE COUNCIL.

As in several former years, the Executive Council of the Inventors' Institute in their Reports for such years, so now, begin with the statement that the Patent Law, the most prominent of the objects for which the Inventors' Institute was founded, is the subject of legislative action. For the Bill of Messrs. Anderson, Mundella, Dalrymple, and Alex. Brown is before the House of oCmmons—a Bill in effect the same as that introduced by those gentlemen in the session subsisting at the time of our last annual meeting, for the present Bill enlarges the term of letters-patent from fourteen to twenty-one years, and at the same time reduces the cost to a considerable extent; that is to say, the existing stamp duties are by this Bill replaced by a schedule of duties which is lower than the schedules in their former Bill, viz., the stamp on petition for letters-patent is £1 5s., instead of £2 10s.; and on certificate of record of notice to proceed £1 5s., instead of £2 10s. This Bill, although it aims only at an instalment of reform, namely, reduction of cost (the extension of time to twenty one years being the only clause outside of cost), and does not in any way reverse the present system, either in regard to the granting of patents or in reference to rendering the grant more secure, certain, and protective, is nevertheless a step in the right direction, as was the Bill of the last session of Parliament. It has been estimated as such by the Executive Council; and, looking at the difficulty of obtaining any common agreement on the details of a good Patent Law, many persons whose opinions are worth consideration have suggested that the Bill might be an acceptable settlement of the Patent question for the present time if the term of provisional protection were prolonged to one year, as in the Attorney-General's Bill, and its cost reduced to ten shillings; and, in addition to this, special paid Commissioners were appointed to work the patent system with every regard to facilitating investigation into the novelty of patenting inventions and pointing out to Parliament what amendments in the Patent Laws are desirable.

But Messrs. Anderson, Mundella, Dalrymple, and Brown's legislative effort is in competition with a Government Bill, the Attorney-General having brought in a Bill (No. 2) entitled "A Bill to consolidate, with amendments, the Acts relating to Letters-Patent for Inventions." The details which have been given in the *Journal* of the Inventors' Institute (the SCIENTIFIC REVIEW) (especially in the May number) of this Bill are very similar to those of the Bill brought into the House of Commons by the Attorney-General two years ago. It differs, however, in having no provision for examiners, &c., and not possessing many of the objectionable provisions of the former Bills. However, it still retains the compulsory working and compulsory licensing clauses, and a number of the other objectionable features of the former Bills; and last, though not least, the retention of too many of the excessive stamp duties at present payable. On this Bill the Council have so far taken action as to prepare a statement of suggestions, &c. (published in the May number of the *Journal*, and posted to all the members of the Institute), and the Secretary has forwarded the same to members of the Government and Legislature; thus they now come before the members of the Institute seeking an expression of opinion from them on the statement of suggestions referred to.

Referring still to the Patent Law question, the Council have to direct the attention of the members of the Institute to the action taken at the Paris International Congress on the Patent Laws, held in connection with last year's Exhibition. At this Congress Sir Antonio Brady, our President, and Admiral J. H. Selwyn, Vice-President, represented the Institute, and it is not too much to say that the action taken by them thereat was productive of great practical benefit, for we have it upon the testimony of Mr. Carl Pieper, of Dresden, the Secretary of the International Patent Congress at Vienna, that to them, and to Admiral Selwyn especially, the avoidance of many impracticabilities in the action of that Congress was due.

The Patent Congress at Paris has some connection with another movement which has still to be worked out, viz., the International Code of Commerce Congress, with regard to which we have to mention that there is to be a meeting at the Guildhall, London, in the autumn, and as our Vice-President, Admiral Selwyn, will be present as a member of it, we hope that further advantages may be secured for the Inventors' cause, and of this we are led to feel some confidence, inasmuch as it has been intimated that the views of that body as regards the Patent Laws are to a considerable extent the same as those of the Inventors' Institute.

Although the Patent Laws have absorbed the attention of the Executive Council to a very considerable extent, the other objects for which the Institute was established have not been neglected; but owing to the very inclement weather that has prevailed during the last session of the Institute, it has been almost impossible to get up good evening meetings; still several papers of the highest importance have been read at well-attended meetings, and discussions had thereon. Amongst these we may mention the papers on—

"Improvements in Non-intoxicant Beers or Beverages." By Mr. Mantle, on behalf of Mr. Larmuth, the inventor.

"The Electric Light." By the Secretary of the Institute.

"The Electric Light, with special reference to Higgins's Improved Electric Lamp." By F. H. Varley, Esq., C.E., &c.

"On Trade-Mark Registration as affecting Inventors." By Mr. F. W. Campin, Barrister at-law.

The Patent Law Question has been fully discussed at several meetings.

Other meetings have been devoted to expositions of inventions, notices whereof have been published in the journal of the Institute (SCIENTIFIC REVIEW). In that journal full Reports of the papers read and discussions thereon will be found detailed.

The Executive Council propose that the thanks of the General Meeting be given to the readers of all the papers above mentioned, as also to the inventors who brought their inventions before the Institute.

As regards the finances, the Executive

Council have to remark that it having been determined at the last Annual General Meeting that great improvements could be made in regard to the accounts and balance-sheet arrangements, a Committee was appointed, consisting of the President, Vice-President, Admiral Selwyn, Dr. J. M'Grigor Croft, and F. H. Varley, Esq., who were empowered to settle that question, and prepare and pass a sufficient balance-sheet for the year 1877-78. This has been duly attended to. Further, a balance-sheet for the present year has been prepared, under the direction of the Executive Council, and audited by J. P. Cutts, Esq., auditor, appointed at the last Annual General Meeting.

The Executive Council have had pressed upon their notice a portion of the new rules, which requires that body to have a quorum of four members, *exclusive* of the Secretary, before any business can be transacted; and Mr. F. H. Varley and Mr. T. Blanchett are prepared to propose and second a resolution amending this rule, so that in future *three members* of the Executive Council, exclusive of the Secretary, shall be deemed sufficient. This proposition the Executive Council are not prepared to oppose, for they have found that on several occasions, when Executive Council meetings have been summoned, three members have, at expense and inconvenience to themselves, attended at the time appointed, and have had to go away without doing any business for the want of the attendance of a fourth member, and, in consequence, the business of the Institute has suffered by delays arising from postponed action.

In conclusion, the Executive Council may observe that they have now adverted to every matter proper to be brought before the general body of the members of the Institute, and it therefore only remains to state that, according to the rules, one-third of the Executive Council have to-day to retire from office, but are eligible for re-election. Those who now retire are—Captain Fairholme, R.N., Mr. T. Morgan, Mr. S. Calley, and Mr. Allardyce. They are all offered for reelection except Mr. Allardyce, and they may remark that notices sent to this gentleman's address have been returned by post, so that it cannot be ascertained if he be willing to serve on the Executive Council.

This report having been read, the Chairman moved that it be received and adopted. This being seconded by Mr. Braby, was put to the meeting and resolved unanimously in the affirmative.

The Acting Treasurer, Mr. G. A. Stretton, then produced and read the balance sheet—No. 1, receipts and disbursements; No. 2, assets and liabilities. Audited by J. P. Cutts, Esq., the auditor of the Institute; and, on the motion of the Chairman, seconded by Mr. Greenfield, the balance sheet was passed and adopted unanimously.

The Secretary then adverted to the fact that at the last annual general meeting the Presidentship and Vice-Presidentship, as per published lists, were rendered permanent; hence no re-election of those officers was necessary; but it was open to any member to propose any addition to the list, and he mentioned that there were two gentlemen, Mr. F. H. Varley, who had for years past held the position of Chairman of the Executive Council, and the esteemed member now occupying the chair, Dr. J. M'Grigor Croft, who might well be considered as worthy of the position of Vice-Presidents. The Executive Council had, however, made no recommendation as to any addition to the present list.

The General Council list was then read over by the Secretary, and the whole of the gentlemen on the list were, on the motion of the Chairman, seconded by Mr. Greenfield, unanimously re-elected, with the addition of the name of Mr. Hume Williams, barrister-at-law, an active and much-esteemed member of the Institute, who had done much to advance the inventors' cause.

It was resolved, on the motion of the Chairman, seconded by Mr. T. Blanchett, that the retiring members of the Executive Council, namely, Captain Fairholme, Mr. T. Morgan, and Mr. Calley, be re-elected, and that Mr. Greenfield be elected in the place of Mr. Allardyce.

It was moved by the Chairman, and seconded by Mr. F. H. Varley, that Mr. F. W. Campin be re-elected Secretary. This resolution was supported by Mr. F. Braby, who desired to add an expression of opinion on behalf of the members of the Institute of the great benefit derived by its retaining the services of a gentleman so earnest in the cause of Patent Law reform, and so well qualified to advise the Institute on the legal questions involved therein.

It was moved by Mr. F. H. Varley, and seconded by Mr. Zingler, and carried unanimously, that Mr. J. P. Cutts be elected the Auditor of the Institute.

It was moved by Mr. F. H. Varley, seconded by Mr. T. Blanchett, and carried unanimously, that Rule 4 be so far amended as to read "four instead of five members, which may include the Secretary (when a member of the Institute)," thus making the quorum of the Executive Council three members, exclusive of the Secretary.

It was moved by the Secretary, seconded by Mr. Braby, and carried unanimously, that when by death or other cause a seat on the Executive Council shall be vacant, a new member may be selected and appointed by the Executive Council to fill the vacancy, who shall, however, retain his seat only till the next general meeting, when he must be re-elected if to remain on the Executive Council.

The Government Patent Bill was then discussed, and it was unanimously resolved—on the motion of Mr. Braby, seconded by Mr. Blanchett—that the suggestions for amendment of the Bill set forth in the critical analysis thereof, published in the last May number of the Scientific Review, are hereby approved of, and it is resolved that action be taken to urge same upon the attention of the Attorney-General and the other members of Parliament having charge of the Bill.

It was suggested that a deputation to the Attorney-General would be desirable.

The usual vote of thanks to the President, with expressions of regret for his indisposition, and a desire for his restoration to health, Vice-Presidents, General and Executive Council, the Secretary, and the Auditor concluded the proceedings.

INTERNATIONAL EXHIBITION OF INDUSTRIAL SCIENCE AT PARIS.

An International Exhibition of the Sciences applied to Industry will be held in the Palais de l'Industrie, Paris, from July 24 till November 25, 1879.

The President of the Superior Committee is M. Cocherie, Under Secretary of State at the Ministry of Finance; the Secretary-General, M. De la Bruyère, Administrateur de la Caisse d'Epargne de Paris; and the Director, M. P. Nicole, Administrateur Général de l'Union Syndicate de Paris, who organised the Havre Exhibition in 1867, and the Exposition Maritime et Fluviale in 1875.

The scope of the Exhibition can best be appreciated from a summary of its programme, which comprises 9 groups, with 69 classes, as follows:—

Group I. relates to Prehistoric Knowledge, Anthropology, and Education.—Class 1 embraces ethnographical collections, illustrating the life of primitive man and modern savages, with specimens of prehistoric habitations, while, by way of contrast, Class 2 will contain specimens of various industries at the present day, showing the life of civilised beings in different countries. Class 3 is devoted to ecclesiastical art, and Class 4 to education and instruction, comprising schools for the deaf and dumb and blind; trade — commercial and agricultural — schools; the higher education, and apparatus and methods of instruction.

Group II.—Applied Physics.—Class 5 includes all the more recent applications of electricity, and the electric light; Class 6, the electric telegraph, with the various transmitting and receiving instruments, and the working of the telephone on telegraphic wires; Class 7, processes and specimens of electro-metallurgy; Class 8, optical instruments for both science and industry; Class 9, photography, including its new applications, and other means of utilising light; Class 10 (the production of heat and cold) embraces the utilisation of solar and terrestrial heat, machines for making artificial ice, and for the liquefaction of gases, as well as instruments for measuring degrees of heat and cold; Class 11 (warming, lighting, and ventilation) includes fireplaces, stoves, apparatus for the use of mineral oil for domestic and industrial purposes, artificial gas and electrical illumination; Class 12 relates to hydrostatics, hydraulics, and pneumatics; and Class 13, to the production and utilisation of sound, acoustic telegraph, the telephone, aerophone, and phonograph.

Group III.—Applied Chemistry.—Class 14.—The manufacture of artificial products. Class 15. Bleaching, dyeing, and printing stuffs. Class 16. Chemical apparatus and cases of testing materials. Class 17. Chemical processes in glass manufacture, and specimens of various glass work. Class 18. Processes of raw materials employed in porcelain manufacture, with specimens of the various products. Class 19. Perfumery. Class 20. Pharmaceutical and hygienic chemistry. Class 21. Wall paper and imitation leather. Class 22. Leather and hides, with their applications. Class 23. Appliances and products of the india-rubber and gutta-percha trade. Class 24. Preserved foods, and apparatus for their preparation.

Group IV.—Applied Mechanics.—Class 25. Mechanics applied to the liberal arts, printing and lithographic presses, voting and writing machines. Class 26. Machines applied to furniture and musical instruments. Class 27. Machines and tools used in Morocco leather manufacture, marquetry, and toy making. Class 28. Goldsmith's work and clockmaking. Class 29. Weaving. Class 30. Manufacture of shoes and hats. Class 31. Making nets and other appliances for fishing. Class 33 includes agricultural implements, machines, and appliances for the preparation of food. Class 34 is restricted to mining and metallurgical plant, including steam engines, models of underground workings, appliances for the driving of tunnels, foundations by means of compressed air, furnace bars with water circulation, metals, alloys, and specimens. Class 35 embraces the plant of chemical works, paper mills, and dye works, new motors, utilisation of the force of the tides, removing incrustation from steam boilers, &c.; and Class 36, the manufacture of arms and projectiles.

Group V.—Mechanics Applied to Locomotion.—In Class 37 will be represented railway plant, permanent way, and their maintenance, steep gradient lines; improvement in railway carriages, their lighting and heating; steam tram cars, locomotives working with compressed air, and traction engines; new brakes; underground lines and tunnels; and in Class 38 vehicles of different kinds employed by various nations, and velocipedes. Class 39 is devoted to navigation, and Class 40 to aeronautics; Class 41 to travelling appliances, including portable apparatus for scientific expeditions; and Class 42 to articles and products employed in the packing of goods, and lifting machinery.

Group VI.—Applications of Natural Science (Class 43) to Agriculture and Horticulture, and (Class 44) to Forestry.—Class 45 relates to the various natural products employed in industry; Class 46 to the utilisation of textile fibres, basket work, straw paper, and cardboard; Class 47 to artificial flowers, fruits, and shrubs; Class 48 to natural history, with appliances for the taxidermist; Class 49 to useful and injurious insects, with methods for the destruction of the phylloxera. In Class 50 will be found specimens of alimentary substances. Class 51 relates to pisciculture; Class 52 to fisheries; Class 53 to non-alimentary sea produce; Class 54 to medical science and instruments, and the acclimatization of cinchona and the eucalyptus in Africa and the South of France; Class 55 to surgical science and instruments; and Class 56 to dentistry. Class 57 covers the wide field of sanitary science, individual and general, comprising discoveries relating to hygiene and the well being of the working classes, baths, gymnasiums; public and private closets, the purification and utilisation of water, sluices, and sewers; appliances connected with highways and systems of paving; fire engines and fire signals; waterworks and mains; matters relating to hospitals and models; and, finally, appliances for cremation.

Group VII.—Mathematical Instruments for (Class 58) measuring, dividing, and calculation; (Class 59) astronomy and navigation, including balances, weights, and measures; (Class 60) astronomy; (Class 61) meteorology, and (Class 62) horology, including astronomical clocks and chronometers, public clocks and their illumination, pedometers, &c.

Group VIII.—Geology (Class 63) applied to agriculture and (Class 64) industry; artificial stone and raw products for ceramic art, with specimens. Class 65 includes mineral fuels and exploring plant, works for obtaining a water supply, artesian wells Class 66. Precious stones. Class 67. Geological and palæontological collections, plans, and sections.

Group IX.—In Class 68 will be found books, manuscripts, and designs relating to the classes of the Exhibition; while Class 69 will consist of replies to a series of questions, addressed to each exhibitor, either introduced or under consideration.

Group X.—Special Exhibit of the Direction of the Exhibition of Sciences Applied to Chemistry.—A. Reproduction of a glacier (about 10 metres high), with an internal grotto, wherein will be figured the different terrestrial formations, and the fossils met with in each of them. B. Reproduction on a large scale of a prehistoric habitation, a habitation of modern savages, and a model house of the present day, in which hygiene, comfort and luxury have been attended to. C. A map in relief of Europe at the tertiary epoch. D. A grand dioramic view of the spot where Paris now stands, before the apparition of man on earth. E. Grand dioramic view of the same spot during the cave period.

Group XI. embraces a loan collection of artistic and industrial objects, and also temporary exhibitions of flowers, fruits, and vegetables.

The aim of the directors of the Exhibition is make it excel not in bulk, but in the careful selection and educational value of the objects and processes exhibited. The charge for exhibition space is low, and no charge will be made to workmen, scientific societies, museums, governments, and exhibitors generally, whose productions are of an exceptionally interesting character.

ARTIFICIAL LIGHTING FOR PHOTOGRAPHY.

THE subject of artificial lighting in the portrait studio is attracting much interest in England.

Three methods are employed for producing a highly actinic light suitable for the purposes of the photographer—the electric, the pyrotechnic, and that produced by the combustion of magnesium wire. Each of these lights has its special disadvantages, and for each the excellence of the results depends far more upon the arrangements for using the light itself. And the arrangements which answer best with one light are apt to be wholly unsuited for use with any other light.

The great difficulty with electric light, next to its excessive cost, is to secure a sufficient diffusion of the rays, and to subdue their intense brilliancy without too great a loss of actinic power. A method of burning pyrotechnic compound in a paper case, whereby a larger illuminating surface is produced, gives, it is said, much better results. In the electric light the rays proceed from a point, diverge rapidly, and as rapidly lose illuminating power. Thus an electric light with six minutes' exposure failed to give anything but the most brightly lighted points of the picture, when the same light, used with an imperfect reflector, gave a better result in two minutes. With the pyrotechnic compound burned in case, or, better, in a saucer, the rays proceed from a surface of considerable extent, and are less divergent; hence at a given distance from the light the loss is much less than with the electric light. When the latter is used with a translucent screen covering the front of the reflector it shows an intensely brilliant centre, surrounded by a circle less brilliant and curiously variegated by a network pattern caused by reflections; while the space between it and the centre appeared quite dark in comparison. With the pyrotechnic light the screen is evenly illuminated, and no light is lost.

When used with an apparatus called the luxograph the results obtained are said to be very fine. The luxograph is described as a slightly conical metal cylinder resembling a kettledrum, nearly six feet across. The drumhead, so to speak, is made of a peculiar paper charged with a mineral which increases the dispersing power of the screen. The interior of the cone, or drum, is lined throughout with small mirrors, making it a powerful reflector. In the centre of the back is a square lantern of blue glass, of three different tints, open at the top. The pyrotechnic powder is burned in the lantern. When the combustion has reached its height the sitter's face is flooded with a soft violet light of the most diffusive and actinic character. The fumes of the pyrotechnic compound and the brevity of the combustion are its chief disadvantages.

The best magnesium light is said to be produced by the lamp made by Mr. A. Brothers, of Manchester. It consists of an arrangement by which three ribbons of magnesium are burned at once, and the light thrown upon the sitter by parabolic reflectors. The great objection to it is the cost of operating it. In a communication to the Edinburgh Photographic Society, Mr. Thos. W. Drinkwater expresses the conviction that the method of the future will employ coal gas. As gas is ordinarily burned, the light lacks both power and actinity; but when the gas has been fortified by the addition of hydrocarbons, or, more especially, when the much lauded Sugg burner is used, an extremely brilliant, cheap, and easily managed light for photographic purposes is said to be attainable. To this process, however, the crucial test of practical use does not appear to have been applied.

In England, with its dull and foggy climate, not to speak of the chronic sunlessness of London, the question of artificial illumination for portraiture is of real and practical moment.

An improved discharge pipe plug for wash basins, patented by Mr. John S. Gilbert, of New York city, is so arranged that it cannot be removed from his wash basin, and will close automatically when released.

LIFTING A RAILWAY BRIDGE WITHOUT STOPPING TRAFFIC.

A DISPATCH from Easton, Pa., dated April 10th, states that the cleverest feat of engineering ever attempted in that region has just been successfully carried out. It seems that, owing to their immense weight, the iron shoes in which rest two of the spans in the long bridge of the Lehigh Valley Railroad, had sunk about an inch, throwing the bridge out of grade. The inside masonry of the pier being less solid than the outer casing, it was evident that the depression would continue; accordingly an iron casing, 12 feet long, 3 feet 3 inches wide, and 3 inches thick, and weighing 7000 pounds, was placed under the spans to elevate them, the spans being raised for that purpose by hydraulic jacks. The spans weigh 180 tons each. The spans were raised, the machinery redressed, the castings placed in position, and the spans lowered, without the stoppage of a single train.

HAM SMOKING.

PROF. W. R. BROOKS, in *Rural New Yorker*, gives the following simple but very effective smoking arrangement for all kinds of meats, especially hams, shoulders, and bacon. The smoking is effected in a very thorough manner and in a short time. The writer had for this morning's breakfast some ham which was smoked in a contrivance precisely similar to this, in six hours. The arrangement can be made by any one without the least trouble, and it is sure to "work" every time. The device consists of a barrel of any suitable size. An ordinary flour or apple barrel will smoke four or five moderate sized hams or shoulders. Both heads are removed and a moveable cover provided for the top. This may be of boards, or an old cloth or tight blanket will answer. A short trench is dug, in which is laid a length of old stove pipe. A large excavation is then made, in which a pan of burning cobs or chips can be placed. This is covered by a tightly fitting plank. One end of the stove pipe communicates with this excavation; over the other end the barrel is placed, the earth banked up around the bottom of the barrel and over the stove pipe, to keep all tight. The meat may be suspended from a stick laid across the top of the barrel, and then all covered tight with an oil cloth or blanket. On placing a pan of smoking cobs or chips in the place provided, the smoke passes through the stove pipe into the barrel, filling it with a dense, cool smoke. Should the support of the hams, &c., break, the latter cannot be hurt by coming in contact with the fire fire or ashes, as sometimes happens in the regular smoke house. The breaking of the support could be avoided by using iron wire or iron rod instead of the stick.

SONG.

THE NAIAD PLEADS TO DAPHNIS.

Daphnis, share thy life with me,
How I grieve to part from thee!
Give me but thy love ideal,
Spare the wound 'tis thine to heal.

Daphnis, why thy voice so mute,
Silent still thy reed and lute?
List, oh list, the lark's sweet strain!
Must I wait for thine in vain?

Daphnis, while my prayers shall be
Full in faith, and all for thee!
While my soul her burden lays,
Turn not coldly from my gaze.

Daphnis, may the fair moon-rise
Clear the cloud that shrouds our eyes:
Now, while gloams the even-light,
Say not still thy last good-night!

HENRY GEORGE HELLON.

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4, ST. MARTIN'S PLACE, TRAFALGAR SQUARE. LONDON.

ESTABLISHED 1ST MAY, 1862.

Past Presidents:

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President, SIR ANTONIO BRADY.

SESSION 1878—1879

Members' Meeting—at 8.15 p.m.—

Thursday, June 5th.—Conference on Patent Bill. Executive Council.

N.B.—The Balance Sheet, 1879, can now be inspected.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

EXECUTIVE COUNCILS.

ON 8th May a meeting of the Executive Council took place, Mr. F. Varley, chairman, presiding. After the confirmation of minutes of the last meeting, the draft of a Report to the Annual General Meeting was read over, and as to its general character approved; also drafts of Balance Sheets.

The arrangements for the General Meeting were agreed to, and it was directed that the amendment of Rule 4, proposed by Mr. F. H. Varley, and seconded by Mr. Blanchett, be alluded to in the Report.

The list of retiring members of the Executive Council was considered; and a vote of five guineas (£5 5s.) was made to the Secretary.

22nd May, 1879.—The Report and Balance Sheets (Nos. 1 and 2) were settled, and the retiring members' list finally disposed of (see report of Annual General Meeting).

MEMBERS' MEETING.

The 8th May was occupied by Mr. Campin's paper "On Trade Mark Registration as Affecting Inventors;" and the Patent Law question.

Monthly Notices.

The trustees of the Lick Fund have applied to Prof. Simon Newcomb to recommend an astronomer who shall make experiments in order to determine the best locality in California for erecting the great instrument which, according to the terms of Mr. Lick's will, they are to cause to be constructed and endow. Mr. Burnham, of Chicago, the well-known observer of double stars, has been selected, and will start on an observing expedition early in the present summer. He takes with him an eight-inch Alvan Clark refractor, and his report is expected to be of general interest.

At the Iron and Steel Institute meeting the President announced that Dr. Siemens, F.R.S., had offered £10,000 towards a fund for providing in Westminster a new house for the meetings of all the societies devoted to applied science.

Mr. W. Valentin, F.C.S., the *Chemical News* of May 2nd announced, was about to retire from the laboratory of the Royal School of Mines, in which he had been superintendent for twenty years, and it was proposed that his long services should be recognised by some testimonial, to carry out which idea a committee was formed. On the same day Mr. W. Valentin died suddenly. His loss (says the *Athenæum*) will be deeply felt by all who have benefited by his guidance in their studies—those of the Old College of Chemistry as well as those of the School of Mines.

Mr. Trenham Reeks.—We have also to announce the death on the 5th ult. of Mr. Trenham Reeks, who has been from its foundation as the Museum of Economic Geology, in Craig's Court, the secretary of that institution. He subsequently filled the offices of librarian and secretary to the Royal School of Mines, and of Curator of the Museum of Practical Geology, in Jermyn-street. His public services extended over a period of nearly forty years, and the admirable Catalogue of the collection of pottery in that museum was the joint production of Sir Henry De La Beche and Mr. Trenham Reeks.

M. Edouard Pictet, the distinguished entomologist, died a short time since at Geneva, at the early age of forty-four years. M. Pictet's collection of Lepidoptera and Neoroptera was the finest in Europe.

Mr. G. A. Lebour, F.G.S., was on the 19th of May elected to the Professorship of Geology in the University of Durham College of Physical Science, Newcastle-on-Tyne, vacant by the death of Prof. David Page. We have just received a Geological Map of the county of Northumberland by Prof. Lebour, which presents several new and important features, such as the outcrop of the coal seams and of the Fell-top and Great Limestone, with the range of the Dolerites, which have never previously been so continuously and satisfactory displayed.

The induction-currents balance, described in a paper read at the meeting of the Royal Society recently, is one of the most remarkable amongst recent inventions. The balance consists of two induced currents from separate induction coils, which are so equal that they neutralise each other. They are connected with three elements of a Daniell's battery, with a small clock and microphone, and a receiving telephone. If a piece of metal is placed in one of the coils, the balance of the currents is disturbed, and the clock is heard to tick; but if another piece of metal, exactly similar, is placed in the opposite coil, the balance is restored, and silence again prevails. From this brief description it will be understood that in this new instrument the physicist has an exquisitely sensitive test of the molecular constitution of many substances, for it detects the presence of mixtures and alloys, however small the quantity. Hence a scale of qualities may be formed; and if the value of silver be placed at 115°, there can be no question that everything that marks 115° must be silver, 52° will be iron, 40° lead, and 10° bismuth; and, further, the instrument is at once affected by magnetism, heat, or strain in the substances under examination, and will indicate even the effect of half a minute's rubbing of a piece of metal between the thumb and finger. Among the many curious facts that have come to light during the experiments is, that a strip of metal placed horizontally against the coil occasions a sound, when held vertically there is no sound; but a square plate of metal produces a sound in either direction. It is not difficult (says the *Athenæum*, from whom we quote) to foresee that by this induction-currents balance Prof. Hughes will add largely to the resources of physical science.

The Scientific Review.

JUNE, 1879.

PROGRESS OF THE MANUFACTURE OF STEEL.

BESSEMER, Siemens, and Whitworth are three names now so well known that they may be said to be as familiar as household words. Each of them is accredited with achievements of the highest order in regard to the manufacture of iron and steel. Industrial progress, however, is by no means linked to great names, though the fame of some inventors far exceeds that of their compeers; hence all who are well acquainted with the activity of the spirit of invention feel no surprise at the announcements that have been made that new processes are brought forward (we believe by Mr. Thomas), by which it is proposed to eliminate phosphorus from the Cleveland iron, and thus, from a raw material of the cheapest kind, to manufacture steel of high quality. The processes in question were made the subjects of three highly interesting papers at the recent meeting of the Iron and Steel Institute, and were thoroughly discussed thereat. Evidence was adduced in favour of them sufficient to encourage a reasonable hope that the difficulties which have for so long a time proved insurmountable may at last be in a fair way to be overcome. The cost and durability of the basic lining have, it is true, to be fully ascertained; and the steel produced has to be tried by the unerring tests incidental to its employment in manufacture and in the arts. Some little time longer must, therefore, be expected to elapse before *data* can be furnished which will justify the formation of absolute conclusions about the value and the economy of the work which has been commenced at Middlesborough. Still it is scarcely possible to doubt that the resources of chemistry will ultimately be triumphant, and that iron will be freed from phosphorus as completely as from other impurities; but, as the writer of the able article in the *Times*, from which we now quote, pertinently observes, it would be premature to say that the victory has yet been gained. In the meanwhile, the tendency of modern research is to render the objects of the endeavour constantly more and more important. It is daily becoming better understood that the qualities of steel are influenced, in a degree that seems hardly credible, by the presence of other substances, in addition to iron and carbon, in quantities which, in any eyes but those of chemists, seem utterly insignificant, but which nevertheless determine the tensile strength, the ductility, and other of the most important properties of the alloy; and it is probable that a time will come when the properties of steel will be determined by careful analysis with as much ease and certainty as they can now be ascertained by the ordinary tests of the workshop. The outcome of such knowledge would be, of course, an endeavour to free iron from all adventitious substances in the converter, to reduce it to a state of chemical purity, and then to confer upon it, by the careful addition of the necessary ingredients, whatever qualities might be desired.

Although the Iron and Steel Institute had the advantage of papers being read by such practical men of eminence as Mr. Adamson, Mr. Maynard, and Mr. Barnaby; on the mechanical properties of iron and steel; on the use of steel in the construction of bridges, and on the use of steel in naval construction, which led to a discussion on the relative merits of the two forms of material, which resembled, in all its essential features, a similar discussion that was called forth at the previous meeting of the Institute by a paper by Mr. Adamson, of which that recently read was a continuation, yet the discussion, both on that and on the present occasion, led to no significant results.

An important element in the future of ductile steel will in all probability be furnished by the degree in which its properties admit of being influenced by the application of Sir Joseph Whitworth's process of compression while in a fluid state. The President of the Institute, in his inaugural address, referred to this process as an excellent one, which, except for guns and armour plates, had not come largely into use; and these words might very well convey an erroneous impression of the facts. It is quite true that the amount of fluid-pressed steel, which has been manufactured is not large when compared with the manufacture of steel generally; and, therefore, in one sense it is correct to say that the material has not come largely into use. But the relatively small quantity has been applied to a great variety of uses, from the construction of screw propeller shafts to the construction of carriage wheels; and in all these uses it has displayed a marked superiority over the comparatively loose and open structure of the uncompressed metal. It is quite possible to obtain the harder varieties of steel free from bubbles of imprisoned gas or air; but in the more ductile varieties these bubbles are always found in considerable numbers; and, although much may be done by careful manufacture to prevent their formation, their presence can never be entirely prevented. By the compressing process the contents of the bubbles are squeezed out, and the sides of the cavities are united, by a force of, perhaps, six tons to the square inch, applied while the metal is in a state of fusion; and some notion of the quantity of gas which is expelled may be derived from the fact that the mass, during compression, is diminished to seven eighths of its original bulk. Instead of being comparatively spongy and riddled by cavities of variable size, it is rendered perfectly homogeneous; so that a small test piece, cut from any part of the compressed casting may, safely be relied upon to furnish a true criterion of the strength of every other portion of the whole. The absolute exclusion of hidden flaws or other weak places, which is thus secured, enables the manufacturer to reduce bulk and weight to the lowest point without unduly reducing strength; and the recent discovery of Mr. Adamson, that much of the bulk which is commonly employed is so placed that it does not add to the strength of the structure, will probably lead to further reductions of a similar kind.

Proceedings of Societies.

ROYAL SOCIETY.

APRIL 24TH.—W. Spottiswoode, Esq., D.C.L., President, in the chair.—The Right Hon. R. A. Cross was admitted into the society. The following papers were read: "On the Nature of the Fur on the Tongue," by Mr. H. T. Butlin; "Note on the Supplementary Forces concerned in the Abdominal Circulation in Man," "Note on the Auxiliary Forces concerned in the Circulation of the Pregnant Uterus and its Contents in Woman," by Dr. B. Hicks; "Summary of an Inquiry into the Functions of Respiration at Various Altitudes on the Island and Peak of Teneriffe," by Mr. W. Marcet; and "Further Researches on the Physiology of Sugar in Relation to the Blood," by Dr. Pavy.

MAY 1ST.—J. Evans, Esq., D.C.L., President, in the chair.—The list of candidates for the Fellowship recommended for election was read. The following papers were read: "A Magnetic Survey of the 40th Parallel in North America between the Atlantic Ocean and the Great Salt Lake, Utah," by Prof. Thorpe; "On certain Definite Integrals occurring in Spherical Harmonic Analysis, and on the Expansion in Series of the Potentials of the Ellipsoid and the Ellipse," by Mr. W. D. Niven; and "On the Origin of the Parallel Roads of Lochaber and their Bearing on other Phenomena of the Glacial Period," by Prof. Prestwich.

GEOGRAPHICAL SOCIETY.

APRIL 28TH.—Sir R. Alcock, V.P., in the chair.—The following gentlemen were elected Fellows: Lord Reay, Messrs. A. H. Dimmer, W. W. Dunkley, J. N. Goren, E. King, R. Mullan, E. T. Wilks; and Prof. Veth, President of the Dutch Geographical Society, an honorary corresponding member. The paper read was "Across China from Chin-Kiang to Bhamo," by the Rev. J. M'Carthy.

SOCIETY OF ARTS.

APRIL 28TH.—The second of the course of Cantor Lectures "On Recent Advances in Telegraphy" was delivered by Mr. W. H. Preece, and was devoted chiefly to a consideration of the modes of transference of electricity, the use of indiarubber, gutta-percha, and other substances as insulators and supports, and the forms and materials used for underground wires and cables.

APRIL 29TH.—Capt. Sir H. Tyler in the chair—Papers "On Light Railways for opening up a Trade with Central Africa," by Mr. John B. Fell, and "On the Advantage of Railway Communication in Africa as compared with any other Mode of Transport," by Mr. J. C. Morrell, were read before the African Section.

APRIL 30TH.—Prof. Roscoe in the chair.—Ten candidates were proposed for election as members. The discussion on Mr. J. Hollway's paper, "On a New Process in Metallurgy" was resumed.

PHYSICAL SOCIETY.

APRIL 26TH.—Prof. W. Adams in the chair. Mr. C. V. Boys gave an account of some experiments made by Dr. Guthrie and himself on the subject of Arago's rotas. Prof. S. Thompson communicated five laboratory notes from University College, Bristol.

GEOLOGICAL SOCIETY.

APRIL 9TH.—H. C. Sorby, Esq., President, in the chair.—Rev. J. Finnemore, Messrs. T. J. Slatter, W. H, Twelvetrees, A. P. Vivian, and E. Westlake were elected Fellows; Prof. B. von Cotta, Dr. N. von Kokscharow, and Dr. J. J. S. Steenstrup were elected foreign members; and Prof. P. J. van Beneden, Prof. G. Guiscardi, and Prof. G. vom Rath, foreign correspondents of the Society. The following communications were read: "On the Geological Age of the Rocks of the Southern Highlands of Ireland, generally known as 'The Dingle Beds,' and 'Glengariff Grits,'" by Prof. E. Hull; "On some Three-toed Footprints from the Triassic Conglomerate of South Wales," and "On the Silurian District of Rhymney and Pen-y-lan, Cardiff," by W. J. Sollas.

APRIL 30TH.—H. C. Sorby, Esq., President, in the chair.—Mr. A. S. Foord was elected a Fellow. The following communications were read: "A Contribution to the History of Mineral Veins," by Mr. J. A. Phillips; "*Vectisaurus Valdensis*, a New Wealden Dinosaur," by Mr. J. W. Hulke; "On the Cudgegong Diamond-field, New South Wales," by Mr. N. Tylor; and "On the Occurrence of the Githyroacaris in the Lower Carboniferous or Calciferous Sandstone Series of Scotland; and on that of a second Species of Anthrapalæmon in these Beds," by Mr. R. Etheridge, jun.

ASIATIC SOCIETY.

APRIL 21ST.—Sir H. C. Rawlinson, President, in the chair.—The Rev. J. Ormiston and Mr. A. C. Macrae were elected resident members; and Messrs. Adamson, Nisbet, and Mitchell, non-resident members. Mr. E. L. Brandreth read a paper "On the Gaurian or Modern Sanskritic Languages of India compared with the Romance," in which he showed that as there was a resemblance between Sanskrit and Latin, so was there, also, between their modern representatives, the same phonetic laws, in fact, prevailing in the modern as in the ancient groups. The principal letter changes were then described, and marked similarities were pointed out, not only in the phonology but in the grammar of each class. Mr. Brandreth further showed that the individual languages could be profitably compared together, as, for instance, Sindhi with Italian, Hindi with French, the two former agreeing in vowel terminations for their words, the two latter in the great curtailment of the words themselves, in a preference for single consonants, and in the nasalisation of the medial vowels. Mr. E. Thomas exhibited two silver coins, struck at Bokhara, of the class described by the late Prof. Lerch at the Oriental Congress of St. Petersburg; and expressed his conviction that he had detected on them the word "Sunnee" or "Orthodox," which had not been previously noticed by any numismatist.

SOCIETY OF ANTIQUARIES.

APRIL 23RD.—Annual Meeting.—The Earl of Carnarvon, President, in the chair.—The Chairman delivered the anniversary address, in which he expressed a hope that from time to time, as occasion might arise, and as the funds might allow, the Society might turn from the labours of the pen to those of the spade, and might contribute—as they had last year contributed to General Lane Fox's excavations—to the encouragement of original explorations conducted on scientific principles. If it be asked, Where are we to find the money for the various schemes he had named? he ventured to think that for any object really national an application to the Treasury would not be made in vain. It would be less easy to answer the question, Where are we to find the men? The labourers are few, and thankful should he be if any words of his could stir up the eminent men among those whom he addressed to add, in the manner indicated, to their reputation and to that of the Society, but it was also not beyond the sphere of his duty, as he ventured to think, to remind the Fellows how important it was in adding to the members to insist on a high standard of qualification, and to exercise care and discrimination in proposing candidates for election. It was thus, and thus only, they could gather and keep together a band of men who, in the words of the "obligation" which every Fellow subscribed on his admission, would "do the utmost in their power to promote the honour and interest of the Society of Antiquaries of London." The following are the names of the gentlemen elected as members of Council and officers: The Earl of Carnarvon, President; F. Ouvry, Earl of Northesk, and Lord Acton, Vice-Presidents; C. S. Perceval, Treasurer; A. W. Franks, Director; D. C. Bell, J. Clarke, C. M. Clode, H. A. Dillon, E. Freshfield, G. W. G. L. Gower, H. H. Howorth, A. C. King, Sir J. Lubbock, Rev. W. D. Macray, O. Morgan, J. W. Ogle, E. Oldfield, H. Reeve, and T. H. Wyatt.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

APRIL 16TH.—Mr. S. Cuming in the chair.—Mr. G. Wright detailed the progress of the arrangements for holding the Congress at Great Yarmouth, and read the programme of places to be visited. Mr. J. Brent described a cup of Castor ware which has been recently found at the Pan Rock, Whitstable, a site which has hitherto only yielded Samian ware, affording evidence that this remarkable spot was a storing place for Roman pottery, and not a manufactory. He exhibited also several bronze celts from Canterbury, &c. In the discussion which followed with respect to the prehistoric character of some of the articles, the Chairman referred to the numerous prehistoric relics found near London Wall. Mr. Myers exhibited a large collection of terra-cotta objects collected by him in Asia Minor and Africa, including a photograph of a remarkable aqueduct at Algiers of early Arabic date, recently destroyed to make way for gas works. The Rev. M. Maynard produced an interesting series of very early articles from Cyprus, among which were some of Egyptian date and style. Mr. L. Brock exhibited a fragment of Gothic tracery work in stone, blackened by smoke, probably the result of the great fire in 1666. It was found in some recent excavations at London Wall. The first paper was by the Chairman, and had for its subject "Easter Eggs." After referring to the derivation of the name "Easter" from the Teuton goddess, who was represented with eggs on her head, he traced the uses of eggs by many early peoples and races. In Christian times the Copts suspended them from the roofs of their churches. They are found in terra-cotta in Etruscan tombs. In England they were supposed to preserve the owners from mischief. In early times there is abundance of evidence that they were worshipped by the Celts, and a remarkable custom still extant in Brittany was dwelt upon. Several examples of much interest were exhibited: one with the emblems of Astarte and Christ; another of iron, of Russian origin, with representation of the Ascension; and a third of Kentish origin, which had been decorated gaily in colours. The second paper was by Mr. C. W. Dymond, who described with great minuteness the present condition of the "Hurlers" in Cornwall and the two other supporting circles, there being three in all. The paper was illustrated by an elaborate plan, which will appear in the *Journal*, showing the position of all the stones which now exist, and their relation to each other.

NUMISMATIC SOCIETY.

APRIL 17TH.—W. S. W. Vaux, Esq., V,P., in the chair.—The Rev. J. Baron, D.D., and Messrs. J. Cossins, C. E. Fewster, and W. Myers were elected members. Mr. R. Hoblyn read a paper "On the Edinburgh Coinage of Queen Anne, 1707-9," of which he exhibited a complete set, consisting of two varieties of the crown, three of the half-crown, eight of the shilling, and four of the sixpence, all bearing the mint-mark E E*. Mr. C. F. Keary read a paper "On the Renaissance Medals of Italy," in the course of which he said that Vittore Pisano or Pisanello, a Veronese painter and a pupil of Andrea del Castagno, might be considered as practically the reviver of the art of making metals. He worked in the middle of the fifteenth century, and has left numerous medals of the highest excellence. The fifteenth century medals, Mr. Keary said, were larger both in actual size and in style of treatment than those of the sixteenth, although some of these are of extreme beauty, the works of Francesco Francia and Benvenuto Cellini being especially remarkable. During the fifteenth century the medals were cast, later on they were more generally struck. Mr. Keary exhibited impressions in plaster of many of the finest examples in the British Museum.

ARCHÆOLOGICAL INSTITUTE.

May 1st.—The Rev. J. F. Russell in the chair.—The Rev. E. Venables sent a paper "On the Progress of the Discoveries of Roman Remains in Lincoln," illustrated by plans, with special reference to the Milliarium discovered on April 2nd, in the very centre of the Roman city, at the intersection of the *viæ* running in the direction of the four cardinal points. This valuable historical monument bears the name of the Emperor Marous Piavonius Victorinus, who reigned less than two years, and it thus shows the interest which the people of a distant province took in all the changes of the Roman empire. The extreme rarity of perfect Roman milestones is well known, but this example is rendered the more interesting from the fact of there being but one other inscription to Victorinus at present known in England, viz., that found at Pyle in South Wales, now preserved in the museum at Swansea. Mr. M. H. Bloxam read a paper on the sepulchral effigy of a Roman citizen found at Caerleon, clad in the *tunica*, *clavus*, and *pœnula*, the prototypes of the ancient ecclesiastical vestments, the alb, the stole, and the chasuble. The author considered that this very interesting figure represented a costume such as was probably worn by the bishops of the early British Church who attended at the Council of Arles in the fourth century. Mr. Bloxam also read a second paper on the effigy of a Signifer or Roman standard-bearer, found at a bastion of the Roman Wall, Bishopsgate, and now preserved in the Guildhall. Among the ocjects exhibited was a very large and fine example of a mazer bowl, inscribed "Be yow mere and glade and soo the masters tokerys do byed," and hall-marked 1554-5. This was mounted upon a silver tazza reversed to form a foot, and hall-marked 1571. Mr. A. Nesbitt sent a photograph of an early English book-cover in the collection of the Duc d'Aremberg, and having affixed to it a fine fifteenth century jet figure of St. James of Compostella in the garb of a pilgrim and seated between two small kneeling figures. Lady Vane contributed some antiquities found in a wall at Hutton in the Forest. The arrangements for the meeting of the Institute at Taunton on August 5th was announced.

INSTITUTION OF CIVIL ENGINEERS.

April 29th.—Mr. Bateman, President, in the chair.—The papers read were: "On Street Carriageway Pavements," by Mr. G. F. Deacon; and "On Wood as a Paving Material under Heavy Traffic," by Mr. O. H. Howarth.

May 6th.—Mr. Bateman, President, in the chair.—The monthly ballot resulted in the election of one member, Mr. J. Leece; of twenty-one associate members, Messrs. W. Beattie, J. S. Beeman, W. S. Crimp, C. Dunscombe, J. S. Forbes, jun., D. Gauntlett, W. B. Godfrey, H. Hawgood, J. E. Hughes, T. B. Hutton, H. A. James, F. W. Johnson, H. B. Joyner, J. T. Kough, W. C. Lewis, F. J. M'Laughlin, J. Newey, J. Pollard, G. B. Reynolds, A. Thuey, and C. Wood; and of four associates, Messrs. J. W. D. Bain, E. Carpmael, W. T. Mousley, and Capt. J. H. Western.

QUEKETT MICROSCOPICAL SOCIETY.

March 28th.—Dr. J. Matthews, V.P., in chair.—Four new members were elected. A paper was read, by Dr. M. C. Cooke, "On the 'Dual Lichen' Hypothesis," in the course of which he subjected the theory of Schwendener to a searching examination, and affirmed the hypothesis to be inconsistent with facts and insufficient to explain the forms in question, and declared that the phenomena with which it dealt could be produced by other means. A discussion ensued, in which Dr. Matthews, Dr. Cooke, Messrs. C. Stewart, Michael, and F. Crisp took part.

April 25th.—T. C. White, Esq., V.P., in the chair.—Six new members were elected, and the results of recent field excursions to Wandsworth, Snaresbrook, and Totteridge were detailed. A paper by Mr. A. Schultz, "On on easy Method of resolving the finest lined Diatomaceous Tests, both dry and uncovered, and in Balsam," was read by the secretary. Mr. A. D. Michael read a paper "On some Peculiarities in the Reproductive System of some of the Acarina," the subject being illustrated by drawings and by preparations exhibited under the microscopes of the room. A paper by Mr. F. A. Bedwell "On a Successful Method of examining *Actinium mesembryanthemum*" was read by the secretary. This paper was illustrated by a coloured diagram.

ROYAL INSTITUTION.

April 7th.—Sir F. Pollock, Bart., V.P., in the chair.—Mrs. F. W. Ball, Messrs. J. J. Aubertin, H. B. Roswell, F. Comyn, C. S. Harris, and T. H. Sowerby were elected members.

MATHEMATICAL SOCIETY.

April 10th.—C. W. Merrifield, Esq., President, in the chair.—Mr. D. M'Alister was elected a member. The following communications were made: "Notes on Quantics of Alternate Numbers used as a means for Determining the Invariants and Covariants of Quantics in General," by the late Prof. Clifford; and "Short Note on the Geometrical Meaning of the Condition for Maximum or Minimum Values of a Function of *n* Variables," by Mr. J. Hammond.

HISTORICAL SOCIETY.

April 10th.—J. Heywood, Esq., in the chair.—Seven members were admitted. Mr. H. E. Malden read a paper entitled "Notes on the Operations of Alexander the Great in Affghanistan." A paper by Mr. W. Hamilton, "On the Origin of the Office of Poet Laureate," was next read.

ANTHROPOLOGICAL INSTITUTE.

April 8th.—Hyde Clarke, Esq., V.P., in chair.—Mr. Coutts Trotter was announced a member. Prof. W. H. Flower read a paper entitled "Illustrations of the Method of Preserving the Dead in Darnley Island, in South Australia." A mummy from Erroch, or Darnley Island, in Torres Straits, inhabited by a Papuan race, was first described. It was fastened in an extended position upon a framework made of pieces of wood, joined together with native cord, and kept in an upright position in the house of the relatives. The surface was covered with red ochre, and a piece of the large Indian volute shell (*Melo Indica*), fashioned into the shape of a shield, was suspended in front of the body, as worn by the warriors in battle. The whole of the viscera had been removed through an aperture in the right flank, which had been carefully closed. Pieces of light wood filled the abdominal cavity. The tongue, larynx, &c., had been removed through the mouth; the lips were not closed, but the jaw was kept from falling by a piece of cord passing close to the bone, through the nostril and round the ramus of the mandible. The orbits were filled with a resinous substance, and imitation eyes of mother-of-pearl introduced. The second specimen described was a dried mummy from near Adelaide, in South Australia, presented in 1845 to the Museum of the Royal College of Surgeons by Sir George Grey. In this case the limbs were bent jointly and fixed by a band of native netting close to the side of the body, the knees being behind the shoulders and the feet close to the hips. The internal organs had not been removed, but the mouth had been filled with emu feathers and carefully sewn up, a tassel of feathers hanging from one corner. Both cases showed a considerable amount of care and trouble bestowed in what was considered the decent and proper care of the body after death, but, as might be expected, a more elaborate development of art was attained in the Papuan than in the Australian. A paper by Mr. M. J. Walhouse was read "On Rag-Bushes and Kindred Observances." The author, referring to the custom of tying pieces of rag to the bushes near springs of healing repute and by the tombs of holy men, once common in England, and still observed on the Continent, adduced evidence of its antiquity and instances of its occurrences in Europe, Africa, throughout Asia, and all over America from the North to Patagonia. He also described some apparent varieties of custom, when other objects than rags were used, but with the same motive, and thought that they, as well as the rags, were offered as symbols of sacrifice or gifts, sometimes for cures of sickness and other benefits.

STATISTICAL SOCIETY.

April 15th.—Sir R. W. Rawson, V.P., in the chair.—The following were elected Fellows: Messrs. H. C. McCrea, W. Poole, G. S. Baden-Powell, J. C. Murray, C. L. Cunningham, W. M. Neil, C. N. Newdegate, T. J. C. L. Bordman, R. L. Curtis, D. Mac Iver, J. W. Lyall, G. Palmer, and R. Adams. Mr. E. G. Ravenstein read a paper "On the Geographical Distribution of the Celtic-Speaking Population of the Celtic Isles." The localities where Irish Gaelic is the language of the majority are comparatively limited and remote areas. In 1851 23·3 per cent of the population spoke Irish, and in 1871 15·3 per cent. The success of the labours of the Society for the Preservation of the Irish Language was referred to, although it cannot be doubted that Irish is on the decrease. Not quite 9 per cent of the Scotch population can speak Scotch Gaelic, and there is no doubt it is dying out. In the Isle of Man 25·6 per cent of the population still understand Manx. Including 60,000 Welsh in England, there are 1,006,100 Welsh-speaking people in Great Britain. The total number of people in the United Kingdom still speaking a Celtic tongue was—Irish Gaelic, 876,600; Scotch Gaelic, 309,250; Manx, 12,500: Welsh, 1,006,100; total, 2,195,450, or nearly 7 per cent of the population of the British Isles.

ENTOMOLOGICAL SOCIETY.

April 2nd.—J. W. Dunning, Esq., V.P., in the chair.—Mr. M'Lachlan exhibited exhibited the cases of a number of species of Brazilian Caddis flies, with the insects bred from the larvæ that manufactured some of them, sent to him by Dr. F. Müller from Santa Catharina, and read extracts (with notes) from Dr. F. Müller's letters on the subject. In reference to the habits of Mantidæ, which has been recently brought under the notice of the society, Mr. Stainton referred to a larval form of probably *Mantis religioso*, which had been forwarded to him in 1866 by Mr. Moggridge, jun., and which from its saltatorial habits that gentleman had described as a "curious grasshopper." De Geer had also drawn attention to the apparent similarity between these insects belonging to different orders, and Mr. Stainton considered that the peculiar motion of the young mantis was an illustration of the remark of Mr. Darwin that the relationship and affinities of animals are often more expressed in the embryonic than in the adult form. Sir S. Saunders exhibited a bag-like fabrication, said to be the production of a large species of spider inhabiting the Fiji Islands. The secretary read a note, by Mr. J. W. Slater, "On Insects Destroyed by Flowers." Miss E. A. Ormerod communicated a paper entitled "Observations on the Effects of Low Temperature on Larvæ." On an examination of many species belonging to different orders during the severe frosts of the past winter none were found materially injured by the low temperature to which they were subjected. Mr. Distant communicated a paper containing "Descriptions of New Species of Hemiptera collected by Dr. Stoliczka during the Forsyth expedition to Kashgar in 1873-74," to form portion of the general work on the scientific results of the expedition now in course of publication at Calcutta.

PHILOLOGICAL SOCIETY.

APRIL 18TH.—Dr. J. A. Murray in the chair. Mr. A. J. Ellis read the first part of his "Report on his Dialectal Investigations," the object of which was to ascertain the pronunciation of English all over the country. In 1868 he began desultory, and in 1873 systematic collections, by obtaining versions of one comparative specimen. Of these 153 had been received, 19 from twelve counties, through the exertions of Prince L. L. Bonaparte; 6 from Scotland and 1 from England, through Dr. Murray; 21 for Yorkshire, by Mr. C. C. Robinson; 24 from four counties, by Mr. T. Hallam; and 20 from five counties, by Mr. J. G. Goodchild. To these five gentlemen Mr. Ellis was under great obligations for long-continued help in every way. These specimens leaving several spots unillustrated, lists of words to be pronounced were sent out to clergymen and others in 1877, of which 314 were returned. Finally, to complete the information, a number of test examples were sent out last February, of which more than 150 have been filled. Thus more than 600 special documents have been obtained for writing an account of English dialectal phonology in the fifth part of Mr. Ellis's "Early English Pronunciation." Mr. Ellis then explained on a very large map the classification he has already formed from this information, and, leaving the characters of the thirty-four groups to be given in the second part of his report, showed the nature of dialectal differences by tracing some constructions, words, and sounds throughout the country.

MAY 2ND.—Dr. J. A. H. Murray in the chair.—Mr. A. J. Ellis read the second and concluding part of his report on his dialectal investigations. This consisted principally in giving the characteristics of the three districts, five divisions, thirteen subdivisions, and thirty-six groups into which he had been led to divide the English dialects. The three districts were Southern (south of a line connecting the south of Shropshire with the north of Essex, and distinguished principally by its peculiar pronunciation of *r* with the *under* part of the tongue turned to the hard palate), Northern (north of a line from the south of Westmoreland, passing north and east of Craven in Yorkshire, north of Leeds, turning southwards at Selby, and when reaching Nottinghamshire passing in a north-easterly direction through North Lincolnshire to the sea just north of Great Grimsby, distinguished by saying *doon* for *down*, the English portion saying *koom doon*, and the Scotch *kum doon*, for *come down*), and Midland (lying between the other two, and having the characteristics of neither, but not homogeneous; the Mid-Eastern, or Norfolk or Suffolk; the North-Eastern, or Lincoln; the Border Eastern, or Hunts, Cambridge, Northampton, and Rutland; the North-Midland, or Craven, and the true Midland and its four borders, or all the other parts of the district, having each its own peculiarities). For Scotland (except Shetland) Mr. Ellis followed Dr. Murray in his "Treatise on the Dialect of the Southern Counties of Scotland," as supplemented by his own collections. Mr. Ellis illustrated his paper by reading numerous dialectal specimens. He calculated that it would require eighteen or twenty-four months to write and pass through the press the fifth part of his "Early English Pronunciation," containing the phonology of the English dialects, founded on these investigations.

METEOROLOGICAL SOCIETY.

APRIL 16TH.—Mr. C. Greaves, President, in the chair.—The following were elected Fellows: The Earl of Durham, the Earl of Powis, Rev. S. Allen, Rev. C. W. Hervey, Messrs. R. W. Abbotts, E. H. Banks, F. J. Bramwell, C. A. Caird, E. H. Cardwell, J. Farquharson, W. Garnett, W. Inskip, and D. Robie. The papers read were: "On the Results of Comparison of Goldschmid's Aneroids," by Mr. G. M. Whipple; and "Observations on the Temperature of the Atlantic during the Month of March," by Mr. P. F. Reinsch.

SOCIETY OF ENGINEERS.

APRIL 21ST.—Mr. J. Bernays, V.P., in the chair.—A paper was read by Mr. J. L. Haddan "On the Essentials which should govern the Construction and Working of Tramways.

ROYAL SOCIETY OF LITERATURE.

MARCH 26TH.—C. Clark, Esq., V.P., in the chair.—Mr. R. Davey read a paper "On Early Italian Dramatic Literature," in which he gave an interesting but concise account of its rise and progress down to the commencement of the seventeenth century.

APRIL 23RD.—Charles Clark, Esq., V.P., in the chair.—Mr. G. Washington Moon read a paper entitled "What is Poetry?"

APRIL 30TH.—Sir P. de Colquhoun, V.P., in the chair.—The following gentlemen were elected as the Council and officers for the ensuing year:—President, H.R.H. the Prince Leopold; vice-president, the Duke of Devonshire, the Very Rev. the Dean of Westminster, Major-General Sir H. C. Rawlinson, Sir P. de Colquhoun, Sir C. Nicholson, Lieut.-General Sir C. Dickson, the Rev. C Babington, C. Clark, and Dr. C. M. Ingleby; Council, J. W. Bone, E. W. Brabrook, C. H. E. Carmichael, J. Ford, C. Harrison, J. Haines, Major Heales, E. G. Highton, R. B. Holt, Dr. W. Knighton, C. H. Long, G. W. Moon, and W. H. Gill; treasurer, C. Clark; auditors, H. W. Willoughby and H. Jeula; hon. librarian, W. de Gray Birch; secretary, W. S. W. Vaux; foreign secretary, C. Goolden.

CHEMICAL SOCIETY.

MARCH 31ST.—Anniversary Meeting.—Dr. Gladstone, President, in the chair.—The President presented his annual report on the state of the society, which he characterised as affording ground for congratulation, the past year having been one of quiet prosperity. The society numbers over one thousand members: sixty-eight papers have been read, and two lectures delivered by Messrs. H. C. Sorby and Mr. S. H. Vines; the Faraday lecture was delivered by Prof. Wurtz. The improved condition of the society's library and journal was touched upon. In conclusion, the President urged the Fellows not to rest satisfied with the present attainments of the society, but to promote research, and especially a general scientific culture in the workers—a culture which should promote largeness of view and prevent each investigator looking on his own subject as one of prime importance to the exclusion of all others. The report of the Research Fund Committee was then read, with a brief account of the investigations carried on in connection with the fund. The following officers and Council were elected for the ensuing year:—President, Warren De La Rue; vice-presidents, F. A. Abel, Sir B. C. Brodie, E. Frankland, J. H. Gladstone, A. W. Hofmann, W. Odling, L. Playfair, A. W. Williamson, F. Field, J. H. Gilbert, N. S. Maskelyne, H. E. Roscoe, R. Angus Smith, and J. Young; secretaries, W. H. Perkin and H. E. Armstrong; foreign secretary, H. Müller; Treasurer, W. J. Russell; other members of Council, M. Carteighe, A. H. Church, W. N. Hartley, C. W. Heaton, E. Riley, W. C. Roberts, W. A. Tilden, W. Thorp, T. E. Thorpe, J. L. W. Thudicum, R. V. Tuson and R. Warington.

APRIL 17TH.—Dr. Roscoe in the chair.—The following communications were made: "On Heptane from *Pinus Sabiana*," by Dr. T. E. Thorpe. Wenzell in 1872 described, under the name of abietene, a hydrocarbon obtained by distilling the exudation of the Californian "nut pine." The author has subjected the crude oil (which occurs in commerce in San Francisco) to an exhaustive chemical and physical examination, and finds that it consists of nearly pure heptane. This discovery, that paraffin is playing the part of oil of turpentine in a tree now living, is exceedingly interesting, as our only natural sources of this hydrocarbon are petroleum and fossil fish oil. "On the Determination of Tartaric Acid in Lees and Inferior Argol," by Mr. B. J. Grosjean. The author suggests several improvements in the well-known oxalate process of Warington—the employment of the method of filtration suggested by Casamajor, the addition of potassium chloride to render the precipitation of the potassium bitartrate complete, precipitation of the latter salt by stirring, &c. By these improvements the author has shortened the time required for an estimation to four hours. "Conditions Affecting the Equilibrium of certain Chemical Systems," by Mr. M. M. P. Muir. The author has carefully studied the influence of time, temperature, and mass on certain reactions: (1) bismuthous chloride, hydrochloric acid, and water; (2) calcium chloride and potassium or sodium carbonate. "On the Action of Oxides on Salts," Part II., by Dr. E. J. Mills and Mr. J. W. Pratt. The authors have examined the actions of aluminic, ferric, and stannic oxides on potassic carbonate at a temperature of 735°. "Examination of Substances by the Time Method," by Mr. J. B. Hannay. The author has arrived at the following conclusion: two hydrated salts, in forming a double salt containing the normal amount of water, expend one-half of the affinity of the anhydrous salt for its water of crystallisation in combining with each other, showing that the formation of double salts is comparable with other forms of chemical action. "Preliminary Note on certain Compounds of Naphthaline and Benzene and Antimony Chloride," &c, by Mr. W. Smith. The author has obtained white needles, which he believes to be trinaphthylstibine or naphthyl oxystibine: he has obtained other crystalline compounds, which have not as yet been examined.

MAY 1ST.—Dr. Warren De La Rue, President, in the chair.—The following papers were read:—"On the Volumes of Liquids at their Boiling Points obtainable from Unit Volumes of thir Gases," by Dr. W. Ramsay. The author has suggested the use of a thin glass bulb filled with the liquid and heated in its own vapour until expansion ceases; the bulb is then allowed to cool and is weighed; thus the volumes of many liquids at their boiling points, "ebullition volumes," have been determined by the author. His results agree closely with those obtained by Kopp. The time required for a determination is half an hour. "On a Method of Precipitating Manganese as Dioxide, and its Application to the Volumetric Determination of Manganese," by Mr. J. Pattinson. Manganese in solution can be completely precipitated as dioxide by bleaching powder solution or bromide water if an equal quantity of iron or ferric chloride be present. The dioxide is then dissolved in dilute sulphuric acid, reduced by standard ferrous sulphate and titrated with bichromate. "On the Determination of Nitric Acid as Nitric Oxide by means of its Action on Mercury," by Mr. R. Warington. In this well-known process of Crum and Frankland, the author has found that the removal of the chlorides is unnecessary, and that small quantities of organic matter, except cane sugar, do not interfere with the results. "On a New Class of Colouring Matters," by Dr. O. N. Witt. By oxidising a mixture of metatoluylene diamine and dimethyl paraphenylen diamin in aqueous solution, the author has obtained several new colouring matters, toluylen blue, violet, pink, &c.

INSTITUTION OF CIVIL ENGINEERS.

APRIL 1ST.—Mr. J. F. Bateman, President, in the chair.—The Council, acting under the provisions of the bye-laws, have recently transferred Messrs. J. Abernethy, jun., J. Kincaid, T. J. F. Nicolls, W. Roberts, W. Rogers, L. Trench, E. R. Turner, and G. Wilson from the class of associates to that of members. The monthly ballot resulted in the election of ten members, Messrs. J. H. Apjohn, E. A. Bernays, E. Budge, C. W. Dymond, J. McGregor, C. W. Odling, A. Paget, V. Rigby, D. Scott, and J. P. Vansittart; of sixteen associate members; and of four associates.

THE CONSTRUCTION OF HEAVY ORDNANCE.

AT a recent meeting of the Institution of Civil Engineers the paper on the above subject by Mr. Longridge, of which the following is an abridgment, was read:—

Nineteen years ago the same subject had been brought before the Institution by the author. In the present communication he proposed to examine the progress since made in gun construction at Woolwich, and especially referred to the official "Treatise on the Construction of Ordinance," printed by order of the Secretary of State for War, in 1877. After pointing out that, in this treatise, it was admitted that the true law of the distribution of tension was unknown to the Woolwich constructors, the author showed that the system adopted by them, and known as the Fraser system, was not based on scientific principles, and led to results both costly and unreliable. The true law connecting the pressures with the tensions was then demonstrated, first, in a homogeneous gun, and, secondly, in a gun built up on the model of a 9-inch Woolwich gun (Mark III.), consisting of a steel tube and a thick iron jacket. It was shown by detailed calculations that, assuming an internal pressure of 24 tons per square inch, the inner surface of the iron jacket would be strained to about 17 tons per square inch, or seven tons above the elastic limit of the material. The was with a shrinkage of one-thousanth of the diameter. A table was next given of the tensions of the iron jacket and steel tube due to an alteration in the shrinkage; and in another table the author showed the variation caused by a change in the moduli of elasticity of the material. Assuming a shrinkage of one-thousandth of the diameter, and moduli of elasticity of 12,700 tons fo iron and of 13,330 tons for steel, the result of repeated firing on the 9-inch Woolwich gun was investigated, from which it appeared that the effect was gradually to reduce the tensions of the iron jacket and increase those of the steel tube, until finally the shrinkage was reduced to zero, and the gun became nearly a homogeneous gun. Under these circumstances it was shown that, whilst the whole bursting strain to be resisted, with an internal pressure of 24 tons per square inch, amounted to 108 tons per side, the steel tube of 3⅜ inches thick supported 52 tons, and the iron jacket of 12 inches thick only 56 tons. Also, that the steel tube was strained to 27 tons per square inch at the inner surface, or 12 tons beyond its elastic limit. As a consequence, permanent set took place, increasing with each successive firing, and finally the gun failed by the cracking of the steel tube. A similar investigation respecting the 81-ton gun showed that a like result would ensue.

The author next gave the dimensions of a gun built according to the dimensions of the true law, of the same calibre as the 81-ton, and showed that in it no portion of the material could ever be strained beyond 10 tons per square inch, with an internal pressure of 24 tons per square inch. After a few remarks on the combination of the longitudinal strain with the circumferential strain during explosion, the author described various types of heavy guns proposed to be built on the system advocated by him in 1860. Those types were:—

1. A muzzle-loading gun of 20-inch calibre, weighing 150 tons, recoiling on its carriage- This gun would be 20 feet long in the chase, and would throw a solid shot of 3000 lbs. with a muzzle velocity of 1600 feet per second.
2. A muzzle-loading 13-inch gun, mounted on an ordinary gun-carriage.
3. A breech-loading 13-inch gun, weighing about 45½ tons.

In conclusion, the author pointed out the great difference in cost between guns thus constructed and the Woolwich guns. In the Blue Book entitled "Army Manufactory Establishments," printed on the 8th of April, 1878, the cost at Woolwich was given as follows:—10-inch guns of 18 tons, £74 per ton; 11-inch guns of 25 tons, 80 per ton; 12½-inch guns of 38 tons, £90 per ton. At the same rate of increase a 150-ton gun would not cost less than £180 per ton. By the author's system the cost of a 150-ton gun would not exceed £35 per ton; a 13-inch muzzle-loading gun, £32 per ton; and a 13-inch breech-loading gun, £50 per ton.

A CHANCE FOR INVENTORS.

UNDER this title the *Scientific American* states that the Secretary of the Treasury (of the United States) has constituted a board, consisting of Captain Forbes, manager of the Massachusetts Humane Society; Captain Moore and Lieut. Sparrow, of the revenue marine service; together with Mr. B. C. Sparrow and Captain Patterson, of the life-saving service, to investigate all plans, devices, and inventions for the improvement of apparatus for use at life-saving stations, which may appear meritorious and available, and to examine and test as far as practicable all such as may be submitted by the general superintendent, and to make detailed reports of the results of the investigations and tests for his information. The scope of the board embraces action upon all devices for the improvement of life-saving apparatus intended to be used at the life-saving stations, except wreck ordnance and its immediate appurtenances, which be referred to a board composed of experts in gunnery, and two practical surfmen to give them aid upon points connected with the actual wreck service. Devices intended to be carried on board ship do not fall within the scope of the action of the board, as this class of life-saving apparatus is taken cognizance of by the steamboat inspector's service. Captain Forbes has been designated president, and has been directed to call a meeting of the board as soon as practicable, as there are already on hand several inventions to be examined. Persons wishing to have their inventions submitted to the board may address Mr. S. I. Kimball, Superintendent of the Life-Saving Service, at Washington, D. C.

STREET PAVEMENTS.

Two papers were read at a recent meeting of the Institution of Civil Engineers, the first one by Mr. George F. Deacon, M.I.C.E., is, according to the abridgment issued from that Institution as follows:—

With respect to the figure of stone sets, the author explained that in order to secure stability their depth should be greater than any other dimension; but that the length should be greater than the width in order to facilitate breaking joint.

A crucial examination of many classes of pavements had satisfied the author, in 1871, that those jointed with asphalt retained their figures better and wore out less rapidly than any others. This method of jointing, however, was often very indifferently performed. Since that date all the Liverpool pavements had been jointed in this manner with great advantage; and all those subject to heavy traffic had been constructed with Portland cement or bituminous concrete foundations. The mode of constructing the foundations and pavements differed in some important respects from that generally adopted, and was fully explained. The Portland cement concrete was mostly prepared in a yard, and not in the street where the work was going on; and the author had proved, by a large number of conclusive experiments, that no loss of strength, but probably a slight gain, arose from allowing such time as was occupied in cartage to elapse between mixing and placing *in situ*. Carriageways of bituminous concrete or asphalt macadam were next described. The smaller stones used for the upper layer of such pavements should not be much harder than the asphalt itself. A large area of this pavement had been constructed in Liverpool, and on sanitary grounds the system would probably be extended over many back streets.

After describing his experience of wood pavements in Liverpool, the author drew the conclusions that, like stone pavements, they should be provided with concrete foundations, the joints should be very close, and the blocks should be creasoted.

Much difference of opinion existed as to the best mode of finishing or binding the surface of macadamised pavements. Under a 15-ton steam roller, preceded by a watering cart, 1200 yards of trap-rock macadam, without binding, could only be moderately consolidated by twenty-seven hours' continuous rolling. If blinded with trap-rock chippings from a stone breaker the same area might be moderately consolidated by the same roller in eighteen hours. If blinded with silicious gravel from three-fourths of an inch to the size of a pin's head, mixed with about one-fourth part of macadam sweepings obtained in wet weather, the area might be thoroughly consolidated in nine hours. Macadam laid according to the last method wore better than that laid by the second, and that laid by the second much better than that laid by the first.

From enquiries made with reference to the loads drawn by horses since the new Liverpool pavements were constructed, as compared with the loads drawn on the old pavements, and without giving credit for the great reduction of wear and tear of horses and vehicles, the author estimated that there was a saving in the cost of cartage alone exceeding £10,000 a year for every mile of such pavement as now laid in the dock line of streets in Liverpool.

Of all pavements for street carriageways macadam appeared to the author to be the least satisfactory. It was the most costly, the dirtiest, and, on the average of all kinds of weather and all conditions of repair, probably involved a greater traction for a given load than any of the other system when thoroughly well laid. Its dirtiness consisted not only in the excessive mud of wet weather and the excessive and impure dust of dry weather, but also in the facility with which organic impurities were absorbed by it, decomposed within it, and exhaled to the atmosphere. In country roads this objection was insignificant, and no other pavement was better than well-maintained macadam; but in some of the carriageways of the West End of London one would regard it as intolerable had it not been tolerated so long. To the unsophisticated provincial the manner in which, on a hot July day, fashionable London rolled over her tainted macadam pavements, apparently without even smelling them, was a mystery almost as great as surrounded the fact that the metropolis, alone among the great centres of civilisation in this country and in the world, still submitted with apparent satisfaction to an intermittent water supply, impure at times in almost every household, however pure the source of that supply might be, when with absolute pecuniary benefit a constant supply might be obtained.

The second paper read was on "Wood as a Paving Material under Heavy Traffic," by Mr. O. H. Howarth, Assoc. Inst. C.E.

The primary point into which the conflicting details of the street pavement problem could usually be resolved, it was stated in the paper, was simply this: That the conditions of road surface demanded by the two main elements of street traffic, viz., the power and the load, were almost essentially opposed. That was, the surface most favourable to the intermittent traction of horses was not the one best adapted for the transmission of rolling load. To reconcile these conditions, so as to render them the least obstructive to each other, was the practical aim of real paving.

A series of observations, collected during the past three years, tended to show that against all the discrepancies which rendered comparisons of street traffic doubtful, opposite conditions been found to arise by which they were compensated in the long run; and that, on the whole, the effect of such minor irregularities was largely controlled by the element of weight. Upon this consideration it became evident that the formula of direct weight per unit of roadway width was that which must afford the least erroneous datum for reducing large series of traffic observations, taken under fixed rules respecting the conditions to be noted. The system adopted by the author aimed at obtaining reliable averages by short and definite observations properly distributed, rather than from continuous counts over an isolated series of hours. The observations were collected by half hours only, at fixed periods throughout the day of sixteen hours, from 7 P.M. to 11 P.M. in every case; such half hours being respectively observed again on other days at the same points and in different conditions of weather. The remaining night hours affording a traffic small in proportion, and at the same time subject to great irregularity with variable circumstances, were excluded, as vitiating the averages required. The system of short observations, while undoubtedly leading to a highly corrected comparative figure, was also found to facilitate the notes respecting weight, which was of necessity collected simultaneously with them. The traffic was divided under seven heads; for the most numerous and important of which the empty weights could be ascertained with precision, and the ordinary description of load estimated without any serious or cumulative error. These averages sufficed to show how widely the actual wear and tear upon any roadway might be misconceived in the light of a merely general or numerical estimate.

Experience afforded by recent trials pointed to the conclusions that the true theoretical condition under which wood should be used was that of a continuous and uninterrupted surface. If a whole street could be conceived to be paved with a single slab or section of fir timber, the surface well inlaid with clean grit or large sand, such road would (apart from expansive action) present, without comparison, the fairest test of the durable qualities of this material.

Upon the basis of these principles the system of paving with wood known as Henson's was introduced in 1875, having for its object the testing of the previous theory that artificial structural foothold was indispensable to afford a fulcrum for tractive power, as well as to show the value of real continuity of surface, by providing the nearest possible approach to an uninterrupted area of wood only. The aim of the experiment was primarily to lay the blocks "heart to heart," upon a sound weight-bearing foundation, so as to present a continuous and uniform surface of wood on end. To such a construction the only foreseen obstacle was the variable expansion and contraction inseparable from that material under varying atmospheric conditions; and this, when accumulated over a large area, would doubtless have been of sufficient extent to become detrimental to the efficiency of a road pavement. With a view to meet this it was borne in mind that the action of capillary expansion in wood was one which must be regarded as exercised slowly, through the minutest distances, but accumulated in proportion to the area of material subject to it. The compensation for such an expansion could, therefore, only be uniformly effected over a large area by providing for the absorption of minute portions of it at the smallest possible intervals, establishing a series of minute compensations throughout the entire structure. The substance which was found in practice to be most available for this purpose was ordinary roofing-felt, from one-sixteenth to one-eighth of an inch thick, a strip of which, cut to the same width as the depth of the blocks, was interposed between each course, and thus formed a close and yet slightly elastic joint. In laying this pavement the system was adopted of driving up the blocks, as every eight or ten courses were laid, by heavy mallets and a plank laid along the face of the work, attention being given to the even range of the courses as this proceeded. The joint was thus closed as completely as possible, leaving only the actual fabric of the felt to take up the expansion, and by the mutual support of the blocks saving them from the rapidly destructive action of spreading at the edges. The protection of the wood was further enhanced by a layer of similar felt over the whole surface of the concrete foundation upon which the superstructure of wood was cushioned. Results tended to show that the several functions of this simple construction were correctly anticipated. The endurance of the wood, consequent upon its relief from vertical jarring and the mutual support of the edges of the blocks, was increased by probably not less than one-half or two-thirds. An even-grained well-grown deal, of medium size and hardness, offered the best conditions, as far as experience went.

As regarded built roads, much was generally said upon the question of elasticity above alluded to; and it was one very commonly misapprehended. Distinction was not made between two widely different theories, viz.:—Was road-elasticity requisite as it affected the traffic, or was it desirable as concerned the road itself? Within limits, it was as advantageous to one as it was demental to the other. Elasticity of road was for the benefit of the traffic exclusively, and not for that of the road; and the inference was that, if anywhere, it should be immediately at the surface, and there only. A totally inelastic road, whether absolutely smooth or designedly uneven, was open to objections, practically, on other grounds; and herein lay the chief characteristic which had brought wood into favour. Concurrently with a reasonable degree of durability, which admitted of being used to the utmost advantage, it presented always, and uniformly, a slight degree of surface elasticity, to the immeasurable saving of vehicles passing over it.

The standard of comparison, therefore, to which street pavements should be referred, must embody the two elements deducible from the preceding remarks, viz., the work performed (as represented by some systematic scale as suggested), and the sum total of direct expenditure upon it during a recognised unit of time. Of three materials—macadam, granite or porphyry sets, and asphalt—the first was beside the question, if only on the ground of its representing under similar circumstances a fixed charge of from 3s. to 6d. per superficial yard per annum. Granite was at the present time more nearly balanced with wood—excelling it somewhat in the matter of cheapness, but outweighed by it on the score of noise and injury to vehicles owing to its rigidity—the latter two defects insuperable, excepting at a cost which was but rarely bestowed upon it. Asphalt, labouring under an occasional deficiency insuperable at any cost, viz., absence of foothold, was nevertheless to be regarded favourably in point of cost, and would rank high so long as the definite solution of the problem of durability stood in abeyance. Meanwhile the above notable failing, together with the difficulty attending partial repairs, must detract from the value of the money-figure to be assigned to it.

In view, therefore, of the few materials at command, and of their several qualities and defects, the following questions comprised the chief issues to be decided:—

1st. Was the policy of paving for heavy traffic to aim at reduction of first cost and the retaining of certain alleged advantages attached to systems of continuous maintenance? or at the extinction of maintenance, and the acquisition of durability, combined with certain alleged disadvantages accompanying great resistance to wear?

2ndly. Could a paved surface be made to fulfil the needs of tractive power by the intrinsic nature of any material, independently of designed mechanical form tending to obstruct free draught of load?

And lastly. Could the durability of any description of wood, compatible with reasonable cost, be enhanced either in construction or in maintenance, so as to place it on a commercial rank with substances of greater resistance, but of less advantage in other respects?

ON DIOPTRIC APPARATUS IN LIGHT-HOUSES FOR THE ELECTRIC LIGHT.

By Mr. JAMES T. CHANCE, Assoc. Inst. C.E.

AT a recent meeting of the Institution of Civil Engineers, Mr. Bateman, President, in the chair, the paper of which the following is an abridgment was read:—

The author briefly premised that in the Fresnel or dioptric system the source of light occupied the central position within a structure of glass zones, or annular segments, by which the incident rays were condensed and directed on the sea; and that there were two principal kinds of dioptric apparatus, the fixed and the revolving. He then proceeded to make some observations concerning the different optical treatment which a small radiant like the electric arc required from that which suited an ordinary flame. In the latter case, as (for it concerned sea lights) the object was not only to parallelise all the rays enanating from any point of the luminary, but also to reduce the vertical divergence due to the height of the flame by increasing the diameter of the optical instrument. On the other hand, the smallness of the electric arc afforded the opportunity of obtaining from the dioptric zones or other elements by suitable generating sections, whatever divergence, whether horizontal or vertical, might be desired. It was also pointed out that the source of light, in the case of the electric arc, could not be entirely depended upon for maintaining the same position in relation to the focal horizontal plane; and that consequently, since the vertical divergence due to the luminary would move upwards or downwards with any vertical displacement of the radiant itself, the mariner could not be absolutely secured from failing to see the light unless a special vertical divergence were given by the dioptric apparatus, independently of that caused by the size of the electric arc. This, however, involved the adoption for this illuminant of a dioptric instrument considerably larger than what was originally contemplated, so as to reduce materially the luminary divergence, and thereby be free to substitute for it, to some extent, a special vertical divergence.

The author stated that in 1862 he had expressed himself in favour of a much larger apparatus than was then employed with the electric light at Dungeness. Also that in 1865 Messrs. D. and T. Stevenson had recommended a third order apparatus for the purpose in their report to the Commissioners of Northern Lighthouses. A similar result was arrived at by the Elder Brethren of the Trinity House, in 1869, in consequence of comparative trials instituted by Professor Tyndall for testing the relative merits of a sixth order light and a third order one respectively, when used with the electric radiant.

The Souter Point Revolving Light, which was first exhibited in January, 1871, was described. Reasons were assigned for adopting two optical agents—one to condense the light in the vertical plane, the other to produce the required horizontal compression—instead of attempting, even for the refracting part of the apparatus, to effect the two condensations respectively by a single agent. Reference was made to the proposal of Mr. Thomas Stevenson, M. Inst. C.E., for attaining this latter desideratum; as likewise to that of Mr. Brebner, M. Inst. C.E., with a similar object. The method actually adopted was similar to that which had been already employed in France for the revolving light with the electric arc. It consisted of a fixed third order light encircling 180°, and of a rotating octagonal drum of the same height surrounding it. Each side of this drum, comprising three panels in height, was composed of vertical refracting prisms, by which the light, radiating in azimuth from the inner fixed apparatus, was compressed horizontally into a beam of 7° 8′ divergence in addition to that due to the diameter of the electric arc. This was done in such a manner that every single prism had its own independent divergence of the same amplitude, whereby was obtained an extent of light-emitting surface of a height of 6½ feet and of 22¼ inches in breadth. Stress was laid upon its being the characteristic feature of the beam issuing from any one of the sides of this glass drum that, in passing before the eye of the observer at sea, its brilliancy would from first to last remain unchanged, as distinguished by the waxing and waning appearance of the ordinary revolving light; consequently, at whatever distance the flash might be visible, the interval of its duration would be the same. Attention was also directed to the valuable suggestion made by Mr. J. N. Douglass, M. Inst. C.E., the engineer to the Trinity House, that advantage should be taken of the landward hemisphere of the radiant light of the electric arc, to provide a beam which should be made to issue through a window in the tower below the main light, in order to mark certain dangers in Sunderland Bay, and it is stated that 54·6 per cent of the rearward hemisphere of light had been thus utilised.

The two fixed lights which were inaugurated at the South Foreland in January, 1872, were described. It was explained how the whole of the catadioptric zones—both upper and lower—were in both lights made to parallelise the rays in the usual manner. The light, however, incident on the refracting portion of each light was distributed over the sea from the horizon to within a short distance from each tower by a succession of increasing angles of vertical divergence, so that the ilumination of the sea became gradually diminished as the distance from land was lessened. In each light there was a rearward arc to spare, and this was turned to valuable account, from 67 to 71 per cent of this light being collected and acted upon by optical agents, which were particularly described, and thereby distributed uniformly over the front azimuthal arc, so as to intensify not only the illumination of the horizon and the distant sea, but also that of the nearer sea.

It was mentioned that the two Lizard Lights, which were both fixed, and were first exhibited in March, 1878, had optical arrangements similar in every respect to those adopted at the South Foreland Lighthouses, with a slight variation in the refracting portions, arising from the circumstance that existing apparatus had to be turned to account in the construction of each apparatus.

A table was appended, showing the condensing powers in the direction of the horizon of the lights described in the paper, distinguishing those optical portions which parallelised the incident light from those which gave to it special vertical divergence. According to this table, upon the assumption that the diameter of the electric arc was twelve millimètres, the condensing powers in the sea-horizon direction were as follows:

Souter Point, revolving	236·38
South Foreland, high fixed	50·17
South Foreland, low fixed	43·40
Two Lizard Lights, fixed	58·44

and data were added for adapting this table to particular cases.

In a second table was given the respective condensing powers over the near sea, at different distances from the lighthouse towers.

Correspondence.

PRITCHETT'S PATENT HOLLOW FLOOR FOR THE CURE OF SMOKY CHIMNEYS.

TO THE EDITOR OF THE SCIENTIFIC AND LITERARY REVIEW.

Sir,—Whilst perusing the remarks in the last issue of your valuable journal upon the application of my patent hollow tubular flooring for the supply of air to house fires, where a deficiency of air causes chimneys to smoke the wrong way, I notice a clerical error near the end of the article, the word "sufficiently" being used instead of "insufficiently." It is well known that the best result and economy in the consumption of fuel is arrived at by supplying air sufficient to promote perfect combustion; thus all heat possible is given out.

This desideratum is effected by my system of tubes under the floor. They are not brought into contact with or too near to the fuel, but the air supplied by them is admitted and mixed with the air of the apartment before actually reaching the fire. Thus the temperature of the room is not lowered perceptibly, and smoke will readily ascend the flue, which before it could not be induced to do in consequence of an "insufficient" supply of air.—Yours, &c.,

G. R. Pritchett, F.R.I.B.A.

Oak Hall, Bishop Stortford,
May 26, 1879.

ISINGLASS FROM SEAWEEDS.

A very interesting product, called "kanten," or vegetable isinglass—a species of gelose derived from either of the seaweeds *Gelidium corneum* or *Plicaria lichenoides*—is made in China and Japan, and exported to Europe in flat and moulded tablets and in bundles of strips. It is known in Cochin China as "hai thao," and is used in France in several industries, especially in the preparation of gold-beater's skin, and for rendering tissues impermeable. It is soluble in boiling water only, of which it takes up some 500 times its weight. It is manufactured as follows:—

The seaweed, called by the native name of "tengusa," is carefully washed and afterwards boiled, so as to form a gluish decoction, which is strained off and put into square boxes. When cool it forms a stiff jelly, which can easily be divided into squares a foot in length. The manner in which the surplus water is removed is very ingenious. The jelly prisms are exposed in the open air during a cold night and allowed to freeze. During the day the sun melts the water, which runs off, leaving behind what one might term the skeleton of white horny substance, which is extremely light and easily dissolved in hot water; when cooled, it again forms a stiff jelly. This article can be applied to many purposes—for culinary uses, for making bonbons and jellies, for clarifying liquids, as a substitute for animal isinglass, for making moulds used by the plaster of Paris workers, for hardening the various materials—in short, as a substitute for all kinds of gelatines, over which it has the advantage of producing a firmer jelly. Another seaweed used for industrial purposes is the "fu," resembling carrageen or Irish moss, and applied to similar uses, such, for instance, as the sizing of the warp of silk goods. Recently the manufacture of an isinglass of this kind has sprung up in France, being made from the seaweeds found on the coast of that country. In its crude state it is a yellowish gelatine, but after repeated experimens under the auspices of the Industrial Society of Rouen, it has been successfully converted into what bids fair to prove the best sizing for cotton cloth known, and will probably entirely supersede the Asiatic product. Macerated in water for twelve hours, boiled for fifteen minutes, and stirred till it becomes cold, the article gives a clear solution, which, as it does not again become a jelly, can be laid in its cold state upon any textile fabric and be left to dry. One invaluable property it possesses is that of defying at common temperatures damp and mildew, and is, therefore, being applied to give a lustre not only to French prints and muslins, but also to woollens and silks.

In China the first quality of the seaweed isinglass is used in a number of industries, especially in stiffening light and transparent gauzes, and the fine silk which is used for making fans, screens, hangings, &c. It is on these stuffs, so well stiffened, that the artists produce such beautiful designs in colours, incomparable for their freshness and brilliancy. A second quality of the article, of darker tint, is used by the maker of paper umbrellas and parasols and pape lanterns, to smear the fine stretchers of bamboo on which they are formed. When thoroughly dried, these articles of such extensive use acquire an impermeability of long duration.

Messrs. E. H. Krier and C. L. Ervin, o Plum Creek, Neb., have invented an improve stencil-plate for marking cattle. The improvement consists in attaching to the pla an upper flange to confine the acid, and downwardly projecting flange that su rounds the letters, and is pressed into clo contact with the hide of the animal to pr vent the spread of the acid employed forming the mark.

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